

Verdad: An Online Peer-Review System for News Articles

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Abstract—The proliferation of fake news has been a growing problem in Philippine society, especially online. There is a growing need for readers to distinguish facts from misinformation, and there is a need for better ways of fact-checking for the media industry. Meanwhile, academic journals already have a reliable system of quality checking: the peer review system. Thus, this study aims to create a similar peer review system for online news articles.

I. INTRODUCTION

Fake news has been a growing problem in Philippine society in recent years. It has even crossed over beyond its social media origins. In an opinion article written by Yen Makabenta for the Manila Times, he notes United States Ambassador to the United Nations Nikki Haley’s support for President Duterte. He quotes, “The Philippines is suffocating. We must give President Duterte the space to run his nation.” However, the statement has been proven to be false, and the source of the quote is a counterfeit of the Al Jazeera website, peddling fake news (Syjuco, 2017).

The fight against fake news is a multi-faceted problem. Still, some works shed light into the situation.

Readers’ biases and their perception of truth is one possible factor in the spread of misinformation. One report found that readers’ bias affects their trust on media. The report found that although there is a general mistrust of the news media, readers trust the news they subscribe to more some (The Media Insight Project, 2017). This shows that personal biases could be a factor on which media readers consume, including fake news. In addition, a model created by Gentzkow and Shapiro (2005) suggests that media organizations are incentivized to cater to these biases. Their model shows that when there is minimal competition and no possible way for readers to perceive the truth, media organizations are free to inject biases to please their reader base. Malicious fake news websites or even established media organizations may take advantage of this and produce falsified that feed into the readers’ biases for revenue.

Another possible reason for the creation of fake news is the time-sensitivity of the online news cycle. An experiment conducted on journalism students found that the time-intensive nature of online newsroom practices may cause writers to disregard fact-checking and other related practices (Himma-Kadakas, 2017). This means that online news publishers may not even care for accuracy in their reporting, and instead resort to fake news that brings in revenue.

Thus, the problem could be solved in two ways: helping readers distinguish errors and biases in news articles, and helping news organizations spot and correct errors in their articles swiftly.

In discussing how to solve the problem of fake news, Hyman (2017) mentions the need for both automatic and manual content analyses for online news articles. There are already several systems that use Artificial Intelligence techniques to identify fake news, like Naive Bayes Classification (Granik & Mesyura, 2017). Though fairly accurate, there is still a need for manual content analysis. There are also several projects that attempt to manually fact-check news articles. Websites such as Politifact (<http://www.politifact.com>) and Snopes (<https://www.snopes.com>) are among such projects, where their respective teams of journalists choose topics to discuss and fact-check (Holan, 2018; Transparency: Methodology, n. d.). Facebook has also teamed up with Rappler and Vera Files to fact-check articles flagged by their users (Magsambol, 2018). Finally, a system called CrowdSouRS has been created to allow users to review the truthfulness of the articles they read (Siddiki, Talha, Crowdhury, & Ferdous, 2017).

To ensure reliable fact-checking, this research proposes the application of peer review systems on news articles. Peer review is a system of quality assurance for academic journal articles. In this system, reputable researchers, called peers, review and critique an article, usually before being published (What is peer review?, n.d.). There are several kinds of peer review systems, but they may not be applicable for already published news articles, especially pre-publication reviews. However, several post-publication peer review systems are available for researchers, such as the systems offered by Faculty of 1000 (Hunter, 2012).

Thus, this research aims to create a post-publication peer review and rating system for online news articles. Specifically, the research aims to design create a web application for the spot-checking of news articles through post-publication peer review, provide a clear rating system for news articles reviewed in the system, test the system’s effectiveness in screening fake news, and determine possible effects of its implementation.

II. REVIEW OF RELATED LITERATURE

A. Fake News and Misinformation in Media

Prevalence of Fake News in the Philippines has not been restricted to online media, but has also influenced written news writers and government officials as well. In an opinion article written by Yen Makabenta, a veteran of The Manila Times, he claimed that American ambassador to the United Nations Nikki Haley has professed her support of President Rodrigo Duterte. As it turns out though, the statement was from a fake news site, a counterfeit of the Al Jazeera website. Similar websites have also touted praises from leaders like

Emmanuel Macron, Angela Merkel and Pope Francis, and several celebrities, all directed to President Duterte (Syjuco, 2017). Additionally, Presidential Communications Operations Office Assistant Secretary Margaux Uson has shared a video alleging a multi-million dollar bank account named to Senator Antonio Trillanes IV. Accordingly, the senator disproved the claim by going to Singapore and personally proving that the account does not exist (ABS-CBN News, 2017). Finally, former Department of Justice Secretary Vitaliano Aguirre II claimed that Senators Antonio Trillanes IV and Paolo Benigno Aquino IV, along with several representatives and local politicians, orchestrated the terror attacks in Marawi City in May 2017. He claimed that they met on May 2 at a hotel in Marawi, and alleged that it was possible that they met to cause the crisis. However, his photo evidence was from a Facebook page of Duterte supporters and were then shared in varying fake news sites. Since then, the concerned parties denied the allegations. Ace Cerilles, included in the photo claimed that the photo was taken on September 2015 in Ilo-Ilo. Senator Aquino attended the Polytechnic University of the Philippines' commencement exercises on that day, and was later in the Senate (Ramos, 2017).

In a report by the Computational Propaganda Research Project, it has been found that the Philippines, along with 28 other countries, have employed tactics like fake news to control the narrative. Fake accounts, run by bots, have been used in the Philippines to fill social media posts with fake news. They also boost posts through likes and shares, making these kinds of misinformation popular. These have been reinforced by "trolls", spreading them further and targeting those with contrary opinions (Bradshaw & Howard, 2017).

This is further corroborated by an interview with Nic Gabunada, a former advertising executive that worked for the campaign of President Duterte. Since they did not have enough budget to run conventional campaign ads, they tapped into social media, targeting several demographics in Philippine society. They were regularly given a "message of the week", targeted messages catered for these demographics. They also utilized overseas workers to create content throughout the day. They took advantage of the reactionary behavior of Filipinos in social media. As Gabunada puts it, "arouse, organize, mobilize." (Lamble & Mohan, 2017)

Research by the Media Insight Project, a collaboration between the American Press Institute and the Associated Press-NORC Center for Public Affairs Research, showed a paradoxical phenomenon regarding the public's trust on media. The data they gathered implies that majority of Americans have an overall distrust of media, but the data also shows that they generally trust the media they subscribe to more than the media as a whole. Previous research already suggested that media trust has been slowly declining since the advent of cable news, and the project's research reflects it when people are asked about the media in general. However, when asked about the media they consume, their sentiments become more positive. Political leanings and age were seen as additional factors as well. Republicans and people below 40 showing less trust in the media in general, and again the trust increases with the media they consume. They propose that a reason for this

may be a lack of distinction between opinion and reporting. The research found out that about a third of Americans cannot distinguish opinion from news, with the statistics only slightly increasing with the media they consume. Political leanings affect these statistics. Nearly half of Republicans and a fifth of Democrats find it difficult to distinguish opinion from news reporting in media in general, with it being less likely for media they consume. (The Media Insight Project, 2017)

Matthew Gentzkow and Jesse Shapiro pointed out that although media organizations attempt to build their reputations through truthful reporting, consumers have a skewed assessment of reporting quality based on their prior belief. This is supported even by later research, like what the Media Insight Project reported. There is also evidence that media organizations cater their reporting and opinion articles to such biases. They then present several models portraying this phenomenon using game theory, to know whether the media organizations or the readers' demands cause this. One model portrays a monopoly, another portrays a media market with competition, and finally with market segmentation. They determine that in monopolies, media organizations try to conform their reporting to their readers' biases. This is then weakened when readers have the ability to know the true state *ex post*. *Ex post* feedback, or knowing the true state after the fact, reduces media bias. As the readers find out 'the truth after the biased reports, the media organizations adjust accordingly leading to more truthful reporting. The same was observed when competition was introduced, as reporting from different organizations allow the readers to discern truth better. If an organization reports differently from other organizations, they run the risk of exposing their reports' inaccuracies, thus reducing their reputation in the eyes of the readers (Gentzkow & Shapiro, 2017).

In an experiment conducted on Estonian journalism students, Marju Himma-Kadakas found that the time-intensive nature of online news publication forces them to forgo fact-checking, revisions, and other related back-stage practices. This causes them to focus only on front-stage performances, like content production and distribution, possibly allowing the spread of fake news. The experiment was conducted on three groups of students over the span of two years. Two groups were taught the product approach (focused on the final article) and the process approach (involved self-reflection, peer coaching, and newsroom simulations). The group who followed the online newsroom work process were only taught the product approach and were required to publish news items every ten minutes for each 6-hour shift. The research found that time constraint greatly affected how the journalism students from the third group worked. Most found it to be a chore and that corners had to be cut, decreasing the quality of their outputs. They also often disregarded stages of the news writing process involved in fact-checking (Himma-Kadakas, 2017).

Joshua Hyman, in discussing how to prevent spread of misinformation in the media, has suggested that four goals needed to be achieved. These are the following: an evaluation standard for media organizations, a combination of automated and manual analyses of content, coordination with the tech-

nology and news industries, and a user-friendly rating system. Media evaluation could be done by enforcing a standard that could ensure accuracy and consistency of bias, and monitor the use of misleading headlines, in-house fact-checking, and prevent ads from masking themselves as content. In addition, Content analysis should involve automated systems using language analysis techniques and manual fact-checking. It should also be done randomly, given the sheer amount of news articles published daily. Cooperation with search engine, news, and social media companies is also key. Finally, an easy to understand rating system should be implemented for users. Hyman suggests borrowing the rating systems from consumer protection programs like Better Business Bureau and Angie's List. In such systems, a rating of A-F is implemented, and Hyman suggests that the system should also consider satirical content. Hyman hopes that this system, when implemented properly, would help alleviate partisan divides and improve political discourse (Hyman, 2017).

B. Computer systems for combating misinformation in the media

With the spread of misinformation in media, several groups have taken the effort to refute such erroneous claims.

One such group is Politifact (<http://www.politifact.com>), an independent non-profit group of editors and journalists based in Florida that counter-checks statements from politicians and other prominent personalities. Statements fact-checked by the group are determined by their journalists or suggested by readers. The statements are chosen regardless of who said it or their opinions.

The group has two rating systems, Truth-O-Meter and Flip-O-Meter. Truth-O-Meter reflects a statement's accuracy, while Flip-O-Meter shows the consistency of a personality's statements on an issue. Flip-O-Meter has the following ratings: True (accurate), Mostly True (accurate but needs more information), Half True (partially accurate but may be taken out of context), Mostly False (only has some grain of truth), and Pants On Fire (outright lie). Flip-O-Meter, on the other hand, has the following ratings: No Flip (opinion stays the same), Half Flip (some changes in a person's opinion), Full Flop (complete change in opinion). In addition to this, they track campaign promises and regularly rechecks their own articles for possible updates or errors (Holan, 2018).

Another group of online fact-checkers is Snopes (<https://www.snopes.com>). Created by David Mikkelsen in 1994, it has since grown as one of the largest fact-checking websites in the Internet. Although beginning with folklores and urban legends, the group has since then covered other materials, like rumors, political statements, and fake news (About Us, n.d.). They choose the topics to fact-check from a list of popular topics, assigned to different members of their staff. The fact-checks are then checked by at least one line editor and two content editors. The line editors check for correct use of language, while the content editors check for comprehensiveness, bias, and proper documentation. The article, after going through the editors, are reviewed again before being published. They also attempt to contact the

sources of the claims and experts in the field. In addition, they also attempt to use non-partisan references. If they use sources from partisan sources, the readers are informed accordingly (Transparency: Methodology, n.d.).

In April 12, 2018, Facebook has partnered with Rappler and Vera Files to fact-check news links shared in their social media platform. According to Clair Deevy, Facebook Director for Community Affairs for Asia Pacific, "Partnering with third-party fact-checking organizations is one of the ways we hope to better identify and reduce the reach of false news that people share on our platform. (Magsambol, 2018)." Rappler and Vera Files are both members of Poynter Institute's International Fact-Checking Network, launched in September 2015 to standardize fact-checking practices and ethics (Funke, Mantzarlis, Elizabeth, & Ricci, n.d.). In this system, Facebook users are can flag news as possibly fake and will be notified if they share a false article. Once flagged, Rappler and Vera Files review the articles and will be less visible in the users' news feeds. Pages that share such articles frequently may face losing visibility, monetization and advertising privileges. Fact checkers also need to provide context for their reviews, under the label "Related Articles" (Magsambol, 2018). However, Facebook received backlash in implementing similar strategies. Users that subscribe to reportedly false news complained when the links they read are visually flagged as such. This prompted them to instead decrease the display size of fake news links, while including links to several links to articles that present a different perspective under "Related Articles" (Constine, 2018).

In addition, there are several emerging computer systems capable of recognizing and classifying misinformation.

Several systems utilize Artificial Intelligence to automatically classify fake news articles. One such system makes use of Naive Bayes Classification, taking advantage of similarities in behavior between fake news articles and spam messages. Created by Mykhailo Granik and Volodymyr Mesyura, the system is able to classify accurate news articles and fake news articles with a total of 75.40% accuracy. However, the system could still be improved by acquiring more training data, using longer articles, ignoring stop words like articles, and several other improvements used in spam filtering. The system also does not take into account partial truths and biases in writing (Granik & Mesyura, 2017).

Another system, CrowdsouRS, relies on user reviews to rate the truthfulness of a news article. CrowdsouRS is a browser extension that enables its users to rate the trustworthiness of an online article. It works by taking reliability scores from users and aggregating them into a reputation server, giving an overall score of an article's reliability. However, the system depends on the users' inputs, and the researchers recognized that the system would work better with larger adoption. (Siddiki, Talha, Crowdhury, & Ferdous, 2017). The system also does not take into account partial truths and biases not perceived by the users.

C. Peer Review Systems

Peer review is a service that ensures the quality of a published journal article. The process involves filtering out

articles slated for publication by assessing their validity, quality and originality with the guidance of reviews from other researchers (What is peer review?, n.d.). To ensure the quality of the reviews, the peers must have published their works in a reputable journal. To ensure minimal conflicts of interest, the reviewer must be from a different institution as the writer and not have collaborated with them in an article (Peerage of Science, n.d.). Several publishing houses like Elsevier and Wiley offer these services in-house, while groups like Peerage of Science offer these services before the writer submits them to a publishing house.

Although peer review processes may differ among organizations, there are several general types of peer reviews. The most common type, Single-blind review, requires that the reviewers remain anonymous from the writers. Anonymity allows reviewers to not hold back in their reviews, but there is concern that the reviewers might sabotage an author's work for their own purposes. Double-blind review makes both the author and reviewers anonymous. This prevents any biases from the reviewers on the authors, both positive or negative. Finally, an open review reveals both the author and reviewers' identities. Some claim that it prevents malicious intent in the reviews, while some claim that the review quality may be degraded without anonymity. Once reviewed by peers, the editors may then choose to accept or reject an article for publication based on the peer reviews (Elsevier, n.d.).

However, peer review is not without its faults. As noted by Jane Hunter, peer review is slow, may present a vector for malicious intent, and may slow down innovation. Peer review is also costly and time-consuming for publishers, and reviewers may also redundantly work on an article that was already peer reviewed from a different publisher. Faculty of 1000 solves this by offering a post-publication peer review system. Instead of reviewing an article before publishing, it is reviewed after the fact. They offer two services, secondary and primary post-publication peer reviews (Hunter, 2012). In secondary post-publication, reviewers write their reviews to determine where a published article is placed in the field (What is F1000 Prime?, n.d.). In primary post-publication peer review, an article is published after an initial check and is then cyclically reviewed by peers and revised (How it Works, n.d.).

III. OBJECTIVES

This research aimed to create a post-publication peer review and rating system for online news articles. Specifically, this research aimed to achieve the following:

- Design a post-publication peer-review system for online news articles
- Create said system as a web application
- Implement and test the system's efficacy and determine other possible effects

IV. METHODOLOGY

A. Design

This system allows any visitor to read reviewed articles without signing up. Meanwhile, users need to be registered while reviewers need to be verified to fully use the service.

For users to sign up, they are required to input their full names and their e-mail address. An e-mail will be sent to them after registration, giving a code to verify their sign-up.

Signing up for Verdad gives the user the privilege to submit articles for review. They need to provide a link to the news article, its title, author, publisher, and the date and time of publishing. Verdad tries to make this easier by suggesting possible titles from the webpage title and publisher based on the website's domain. These submitted articles are displayed on the website, ordered by submission time.

To make sure that reviewers are reliable, a team of administrators verify reviewer profiles before approving them. A reviewer profile requires the professions, affiliations, and contact numbers of a reviewer, along with proofs of their professions and affiliations. The users signing up as reviewers can provide this information through the form, while administrators can verify these applications through the form.

Once approved, reviewers may choose to review an article. Reviewers may belong to a reputable media organization, an academic institution, a non-government organization, a private company, or a government office. For an independent member of the media to be approved for reviewing, they should be a member of either the Kapisanan ng mga Brod-kaster ng Pilipinas (<http://www.kbp.org.ph/>), National Press Club (<http://nationalpressclubphilippines.com/>), or the Photo-journalists' Center of the Philippines (<http://pcp.ph/>).

The reviewer must include a rating of 1-5 stars in their review (5=completely factual and accurate, 4=factual with few omissions or errors, 3=partially true, 2=false with some grain of truth, 1=outright lie). A separate flag is added if an article is a satirical and/or an opinion article. In addition, the reviewer must include a comment on their review, explaining their stance. Sources supporting their review are also required. These review comments, along with the score and a link to a reviewer's profile, will be attached to the articles after submission, for further reading of the users. The reviewer could only review an article once.

Once given a review, a score will be assigned to the article. The final score will be taken from the mean of the review scores, and a satire and/or opinion flag will be assigned to the article if majority of the reviewers flagged the article as satire and/or opinion. The article's score will be updated after each successive review submission.

Reviewers may choose to check other reviews for possible errors. If so, they can report these reviews as possibly erroneous and state their reasons in a comment. These reports will then be checked by a random reviewer or an admin. The checking reviewer will be from a different organization as both the review writer and report submitter. An admin may only check a report if no reviewer is available. The checker will then assess the report if it is erroneous or not. If seen as erroneous, the review will not be displayed anymore and its score will be removed from the article's average.

A flowchart of the user processes is shown in Figure 1.

B. Creation

As the system is a web application, it relied on languages designed for web use. HTML 5.0 and CSS 3.0 was used to

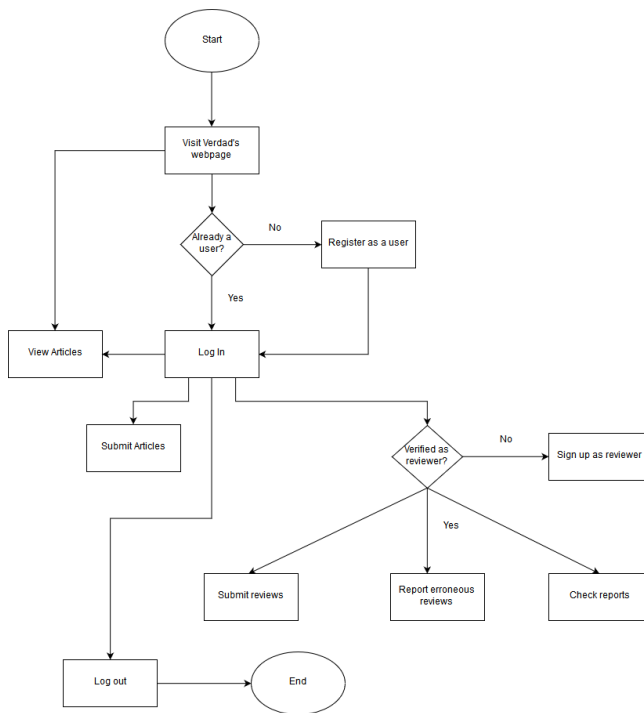


Figure 1. User process flowchart

dictate the basic design layout of the website. Materialized CSS was used to implement Material design specifications. JavaScript was used for client-side scripting, using the JQuery to make the website more dynamic. Server-side scripting was implemented in PHP using Fat-Free Framework. The framework follows the Model-View-Controller architecture. E-mail sending and receiving is done using the Google Mail SMTP service. SQL Database management was handled using MariaDB. Version control was handled using GitHub, and the source code of the project is available through it under Creative Commons License.

The data used in Verdad was stored in a relational database. Figure 2 shows the entity-relational diagram, detailing the relationships between the data.

C. Implementation and Testing

Once completed, the system was made available online through a web hosting service. The system was then be put through an alpha test, with 28 participating users. This helped the researcher find out its effectiveness in screening news articles and to gain insight for Verdad's user experience. A short survey was given to gather sentiments from alpha users. The data collected from this survey were then be processed to gauge the success of the system. These survey forms include the following questions:

User survey:

1) User demographics

- What is your username in Verdad?
- How old are you?
- Which gender do you identify as?
- Which describes your political beliefs?

- Do you agree that all news shared in social media are trustworthy?
- Do you agree that all news from mainstream media (television, radio, newspaper, online versions of news outlets) are trustworthy?
- Which news outlets/publishers do you trust the most?
- Which news outlets/publishers do you distrust the most?

2) User experience

- Do you agree that Verdad's user interface is well-designed?
- Do you agree that signing up to Verdad as a user was fast and easy?
- Do you agree that articles and reviews are easy to read?
- Do you agree that the system is overall easy to use?
- Do you have any suggestions for Verdad's user experience?

3) Effectiveness

- Do you agree that articles were given appropriate reviews and ratings depending on their truthfulness?
- Do you agree that Verdad, as a peer review system for news articles, is able to filter out fake news and other kinds of misinformation in media?
- What do you think of Verdad overall?
- Would you suggest using Verdad to people that you know?
- Do you have any suggestions to make Verdad more effective?

In addition to the user survey, the researcher conducted a test to know if reviewers could properly review news articles. The researcher compiled a list of eight news articles, of varying degrees of truthfulness. These articles are corroborated by similar news articles, other fact-checking efforts like Tsek.ph (<https://tsek.ph/>), and publicly available government documents. For a complete list of the articles and their verifications, see Appendix C. In addition, the researcher added two satirical articles and two opinion articles, giving a total of twelve. These articles are then randomized and submitted into Verdad. The researcher then asked three students from the University of the Philippines Los Baños to fact check and review an article each. The researcher then compared the participants' reviews from the article's corresponding fact checks.

V. RESULTS

A. User Interface

Figure 3 shows Verdad's homepage. From this, a regular visitor may view the articles as shown in Figure 4. If they want to become a user and submit articles, they may click on the register button, and they will be taken to the register page shown in Figure 5. They will be asked to verify their registration by inputting the verification code sent to their email into the prompt in Figure 6.

Once registered, they may submit articles as shown on Figure 7. They may then click the Sign Up As A Reviewer

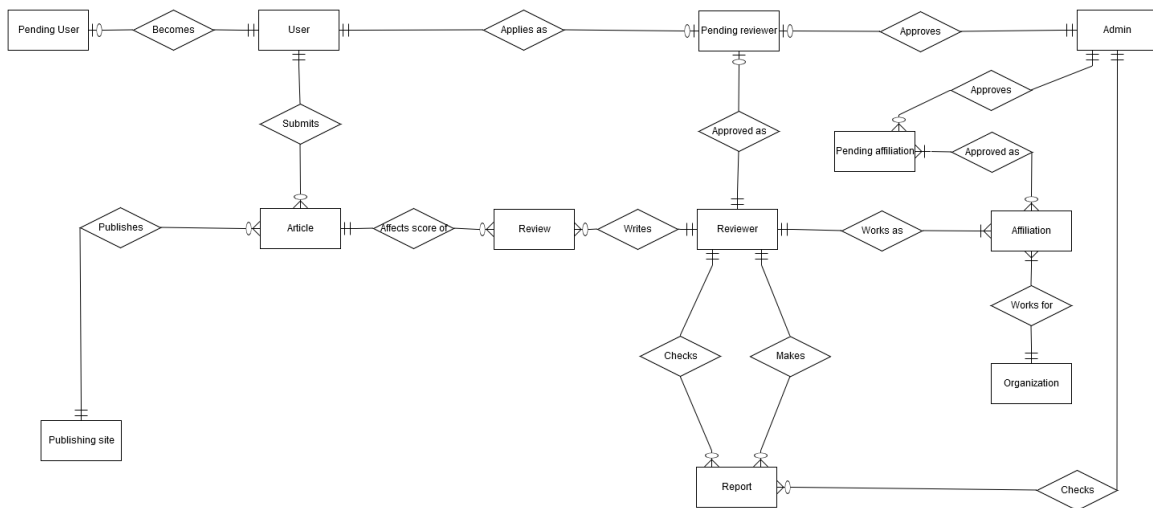


Figure 2. Entity-relationship diagram

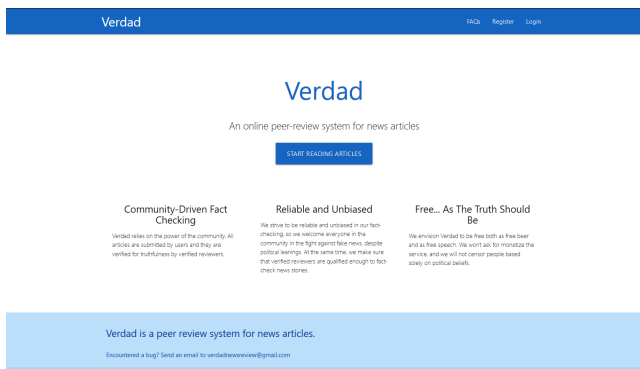


Figure 3. Home page

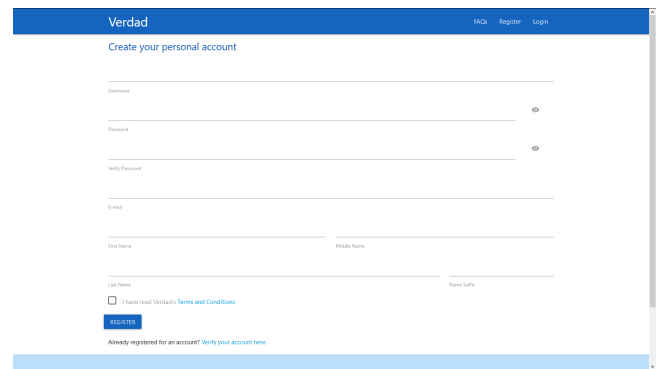


Figure 5. Registration page

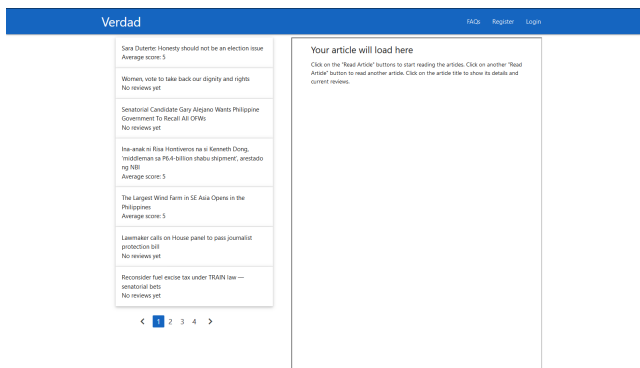


Figure 4. Article list

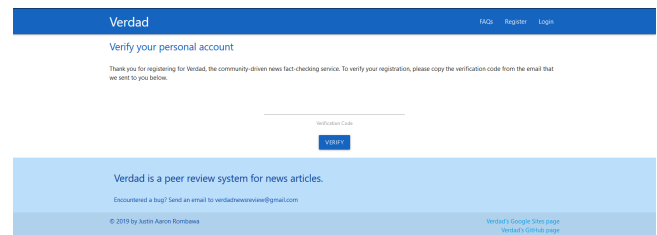


Figure 6. Registration verification page

button to sign up as a verified reviewer. This will take them to the page shown in Figure 8. They will then have to wait for an administrator to verify their registration.

The admin logs in on a separate page. Once logged in, the admin may view pending reviewer requests and reports that they can check, as shown in Figure 9. They may click on one of the pending reviewer requests to view details about the requesting user. This is shown in Figure 10. They may

then approve the user's sign up as reviewer, send an inquiry to them, or deny the user's sign up.

Once verified, a reviewer may now submit reviews and reports. After clicking the Write a Review button on a submitted article, they will be asked to fill out the review form shown in Figure 11. They may also report erroneous reviews by clicking the Report button on a review. They will then be prompted to fill in the report form shown in Figure 12.

Figure 7. User article submission

Figure 8. User signing up as reviewer

A complete set of user interface screenshots may be seen on Appendix A.

The reviewer's profile will also reflect the credentials they sent to Verdad, as shown in Figure 13. They may also check reports assigned to them by clicking the Check Reported Reviews button. This will take them to the reports page where they will be shown a list of reports. Detailed information about each report are given to the checking reviewer, as seen on Figure 14. From here they can approve or deny the report.

B. User Demographics and Media Trust Survey

Majority of the user survey respondents were aged 20-29 and identified as male. 60.7% of them were aged 20-29, followed by those aged 30-39 with 14.3%. This was then followed by 40-49 with 10.7%, then by 50-59 and 10-19 with 7.1% each. 57.1% of the respondents were male, 39.3% were female, and 3.6% were LGBTQ+.

Their political leanings provided more varied demographic information. Most respondents did not know or would rather not state their political leanings, comprising of 28.6% each. The next larger portion of the survey respondents identified as centrist, comprising of 17.9%. Center-left respondents were next, with 10.7%. Finally, left-wing and center-right comprised the rest of respondents, with 7.1% each. There were no right wing survey respondents.

Most of the respondents did not trust news shared from social media. 50% of them disagreed that news shared in social media were trustworthy, while 28.6% strongly disagreed.

Figure 9. Admin home page

Figure 10. Admin view a reviewer request

17.9% remained neutral, while only 3.6% agreed that news in social media was trustworthy. The researcher found that the people that distrusted news in social media the most were those that align themselves politically as left-wing, with all of them expressing strong distrust. In addition, the 3.6% of users that agreed that news from social media is trustworthy did not know their exact political leanings.

On the other hand, most were either neutral to or distrustful of mainstream news media. 39.3% of them were neutral on whether news from mainstream media sources are trustworthy. Meanwhile, 25% disagreed that they were trustworthy, while 21.4% strongly disagreed. Only 14.3% agreed that they were trustworthy, and no respondent strongly agreed. Those that distrust mainstream media the most were those that chose not to state their political leanings, with 62.5% distrusting them and 12.5% strongly distrusting them. The most trustful of mainstream media were those that did not know their political leanings, with 37.5% trusting them. Those that identify as center-left followed, with 33.33% of them trusting mainstream media.

When asked on their most trusted news sources, an overwhelming majority comprised of mainstream media outlets. Out of the 21 responses to this question, 20 were a certain mainstream media source. The most trusted news source by the users were Philippine Daily Inquirer with five responses, and both CNN Philippines and Rappler, with three responses each. However, when asked on their least trusted news sources, the results were more mixed. Out of 19 responses, nine mentioned mainstream media sources, six mentioned news blogs, three

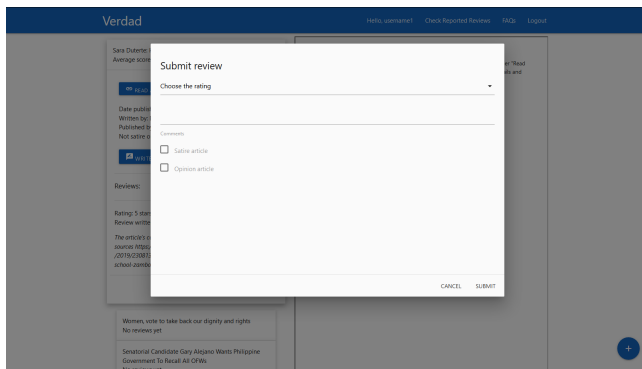


Figure 11. Submit a review

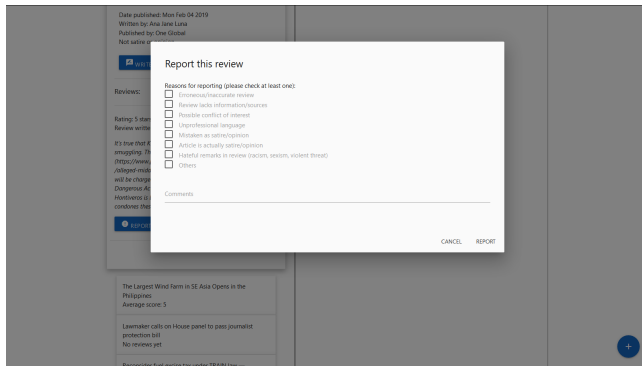


Figure 12. Report a review

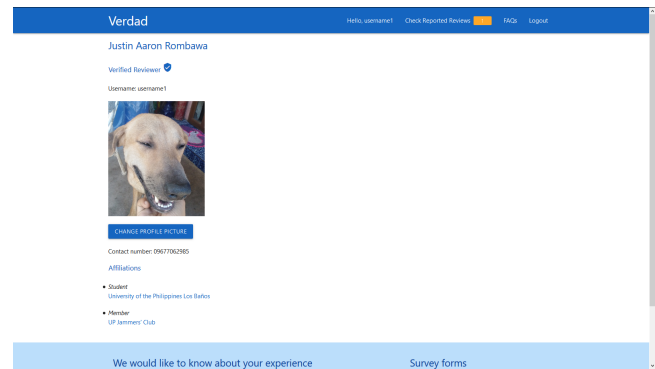


Figure 13. Reviewer profile page

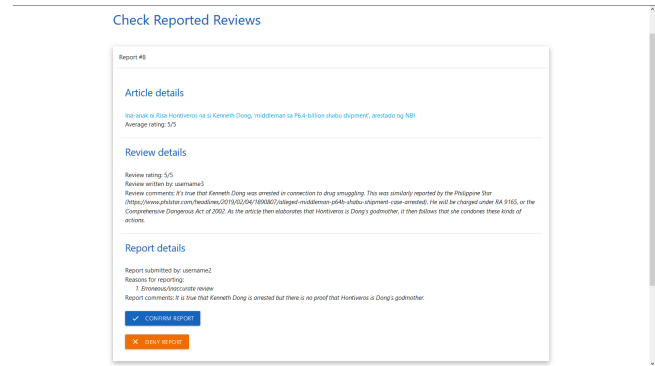


Figure 14. Reviewer check report

mentioned tabloids, and two mentioned social media. These results, when compared to the trust ratings shown above, tell that the users trust the media they subscribe to, but likely not mainstream media in general. These findings on media trust were similar to those found by the Media Insight Project.

C. User Interface and Experience Survey

Most of the users did not have problems navigating through Verdad's user interface. 46.4% of the users agreed and 25% of them strongly agreed that its user interface was well designed. 57.1% agreed while 35.7% strongly agreed that signing up was easy. 53.6% of users agreed and 28.6% strongly agreed that the system was easy to use overall.

However, asking for suggestions regarding the user interface and user experience gave more insightful criticisms. Several users requested for an interface redesign and refinements. Many of them were vague requests for an eye-catching layout. However, others specifically pointed out the researcher's choices of colors and fonts, and designs of several elements like modals, forms, and the article frame. Specifically, the users requested for narrower form fields, refinement of the article selection list, and a broader article frame.

Users also commented about their experience using the website. A user noted that displaying a summary of the article would be helpful. Another user noted some minor loading issues. One user suggested using a captcha on the user registration, before sending the verification e-mail. The same user suggested a browser plugin that displays ratings from

Verdad whenever a reader views an article outside of Verdad. Another user got confused on whether they signed up as a reviewer or as a regular user. This may be averted by another suggestion: to let the user choose at sign-up whether they want to register as a user or as a reviewer. One user suggested the use of notifications, although it was not clarified where notifications will be used. Another user noted a bug where an alert prompt was shown to the user without information. They also noted that less experienced users may think that something went wrong during their registration.

D. User Trust Survey

An overwhelming majority of the users agree that, in ideal circumstances, articles submitted in the system were given appropriate reviews. 82.1% agreed to this sentiment, 7.1% strongly agreed, while 10.7% remained neutral. Majority of the users also trusted that Verdad would be able to filter out fake news and other kinds of misinformation. 67.9% agreed with the statement, 10.7% strongly agreed, while 21.4% remained neutral. This shows that Verdad may become a trustworthy tool in the fight against fake news. 71.4% of the users said that they would suggest using Verdad to others, 25% may recommend it, and 3.6% of the users would not.

When asked for overall comments regarding Verdad, many noted that it is a good initiative in fighting fake news and misinformation. Several, however, noted that it needs to be scaled much larger to become effective. Specifically, the users suggested that the system should be more attractive to

reviewers for more reliable reviews. Some users requested an upvote/downvote or another similar system for reviews and reviewers. Another user noted that reviewers should be publicly verifiable, so that they will be credible to the users. Another suggestion given was the use of machine learning techniques to further screen fake news.

The detailed user survey results may be seen at Appendix B.

E. Reviewer Test

There were three participants in the reviewer experiment: one a student studying AB Communication Arts, another AB Sociology, and another BS Computer Science, all from the University of the Philippines Los Baños. The researcher prepared a list of twelve total articles for the test, shown at Appendix C, including the researcher's expected ratings and the reviewers' corresponding reviews.

The AB Communication Arts student reviewed the travel blog titled *The Largest Wind Farm in SE Asia Opens in the Philippines*, published by Choose Philippines. The researcher expected the article to be scored at least four out of five, as although the article lacked details regarding the wind farm, it is truthful and is corroborated by another article by the Philippine Star. The participant reviewed the article 5/5, citing the same Philippine Star article. Next, the AB Sociology student reviewed the news article titled *Sara Duterte: Honesty should not be an election issue*, published by ABS-CBN News. The reviewer expected the article to be scored two or three out of five. Although the article is factual, Ms. Duterte's statements were misleading, as stated in Rappler's fact check on her statement. The participant was only able to review the article's truthfulness, and rated the article five out of five. Finally, the BS Computer Science student reviewed the opinion article titled *Is it a sin not to vote for Otso Diretso? No, it's not*, published by the Manila Times. The reviewer only expected the article to be tagged as opinion. Surprisingly though, the participant rated the article one out of five, then adding the opinion tag. The participant found inconsistencies in the article regarding several candidates' backgrounds that the researcher was not able to see before.

VI. DISCUSSION AND FUTURE STUDY

Most of the users found Verdad's user interface easy to navigate. However, several made suggestions to improve the system. There were many layout and design suggestions that the researcher would like to incorporate should the project continue. In particular, the researcher would like to fix the layout of several pages, forms, and modals to aid Verdad's readability.

Another user suggested serving a captcha before sending an e-mail verification. The researcher wanted to incorporate a captcha similarly, placing it instead on the verification email to prevent sign-up automation. The researcher understands that this would have helped Verdad's security, but due to time constraints, this idea was temporarily dropped.

Another user suggested that displaying an article summary would be helpful for both readers and reviewers.

The researcher agrees that this is a good idea, and it could be easily implemented through services like SMMRY (<https://smmry.com/>).

Another suggestion was to incorporate Verdad's ratings into a browser plugin, so that readers could also see reviews and ratings while viewing articles outside of Verdad. If this will be implemented in Verdad, the approach would be similar to that of CrowdSouRS, another crowd-based news review system (Siddiki, Talha, Crowdhury, & Ferdous, 2017). However, Verdad would only allow the users to view the article's reviews and ratings, and submit the article for review if none are available.

A first-time user tutorial was also suggested during the survey. Should this be implemented, there should be two tutorials: one for first-time users, and one for first-time reviewers. This could be implemented using Materialize CSS's feature discovery prompts. This feature would help first-time users better than the FAQ page, but it should be implemented with caution as it may be deemed annoying and intrusive by some.

Finally, another user suggested to allow new users to sign up as a regular user or as a reviewer at the get go. The researcher believes that this would prevent some confusion for new users on whether they can already review articles or not. An upvote system was also suggested. The researcher fears that such a system would introduce too much bias into Verdad, promoting only a handful of articles that feed into the user base's biases instead of showing more timely news. As a compromise, two sorting systems may be implemented, one for more popular articles dictated by upvotes and downvotes, and another for newly submitted articles.

Despite these concerns, majority of the users trust that Verdad was able to filter out fake news. Many noted that it was a good initiative, and was promising. However, some of the biggest concerns raised regarding Verdad's trustworthiness and effectiveness were scalability and involvement of reviewers. As a crowd-sourced and peer-based system, Verdad relies heavily on a large user-base. The alpha test was only able to gather 28 users and three reviewers, and involving more users and reviewers would make the system more effective. Involving larger institutions in the project, particularly the media, would also help. The researcher would like to approach these institutions for volunteer reviewers, to handle the influx of user-submitted articles once the system scales to a much larger size. To increase user trust, the reviewers should be publicly verifiable. This was already implemented on the user/reviewer profiles, but more explicit signs of verifiability would improve the system in this regard.

During the reviewer test, most of the participants were able to rate the articles correctly. Two cases were noteworthy though. The AB Sociology student only rated the article's truthfulness, thus giving it a rating of five out of five. However, the researcher expected the article to be rated two or three out of five, since the statements in the content, although technically correct, were misleading. This issue may be solved by including two ratings when applicable, one for the article's content itself, and another for the statements made in the article. These ratings will then be averaged into the final rating which will be shown to the users, along with the two ratings.

On the other hand, the BS Computer Science student surprised the researcher. The researcher only expected the opinion article to be marked as such, but the participant went beyond and called out several discrepancies in the article. This instance shows the power of a peer-based news review system.

The researcher believes, however, that the reviewer experience could still be improved. During the test, the researcher had to remind the participants to include their sources in the comments. However, some reviewers may neglect to include sources once the system is scaled up. To alleviate this, a dynamic form for possibly multiple sources would be required to be submitted along with the review itself. Better formatting tools would also help the reviewer make their reviews more readable. The researcher suggests implementing the use of Markdown, a markup language for basic formatting written in plaintext.

VII. CONCLUSION

Fake news and other kinds of misinformation in media has been a growing problem in Philippine society. In fighting fake news, both automated and manual content analyses are important.

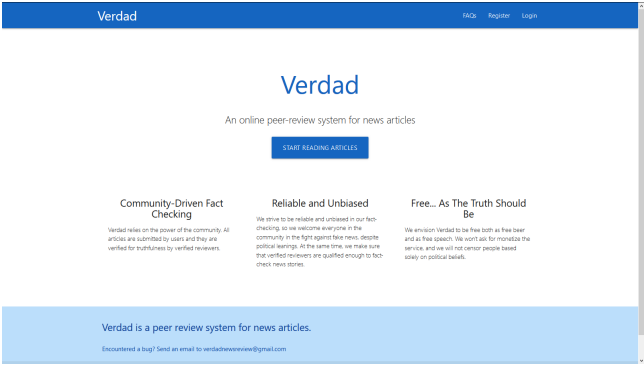
This research reinforces manual news content analysis by creating a system that took influence in the peer review system used in academic journals. Although it needs improvement, it already showed potential as a useful tool in the fight against fake news. Users of the system showed trust in the concept, and the test reviewers performed well, some. Given that the system is scaled properly and public figures are enticed to use the system, the researcher expects Verdad to be effective in fighting fake news.

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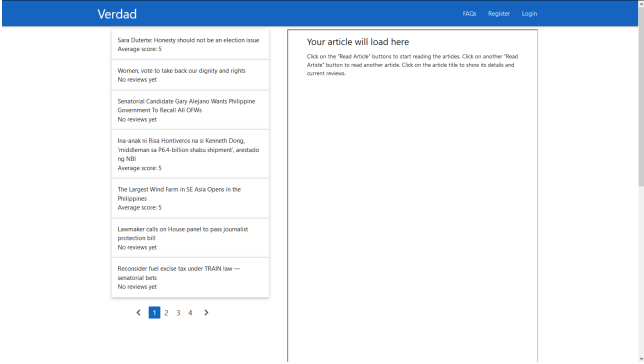
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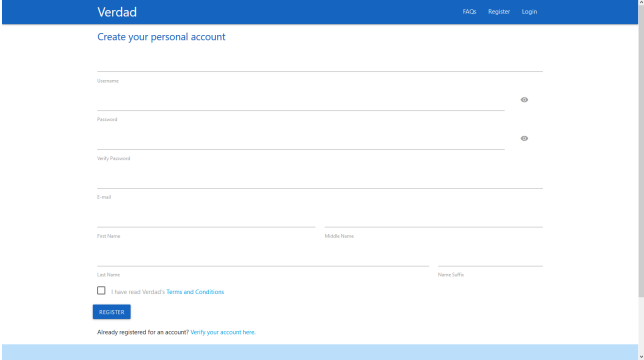
APPENDIX A
USER INTERFACE SCREENSHOTS



Home page



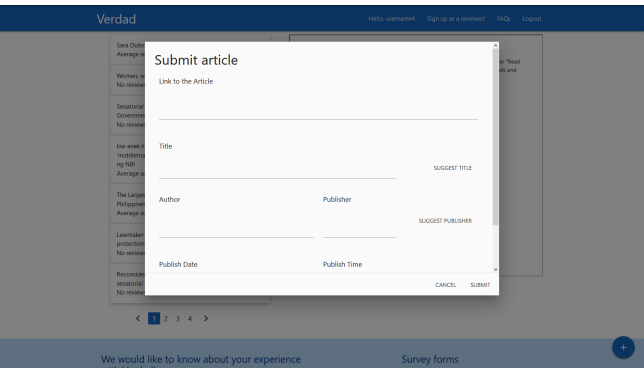
Article list



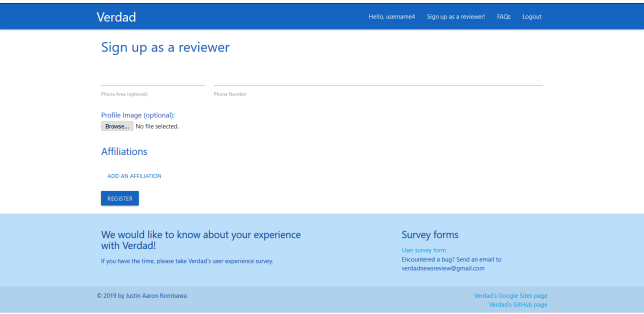
User registration



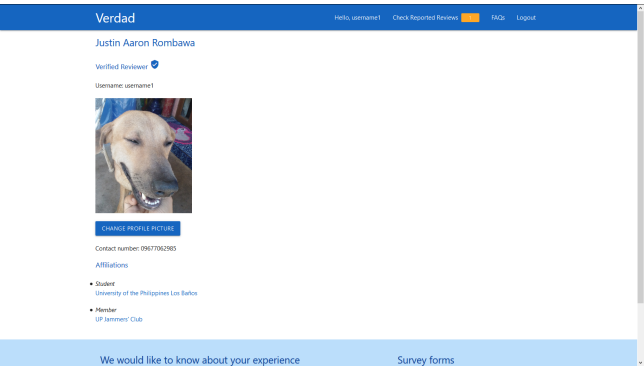
Registration verification prompt



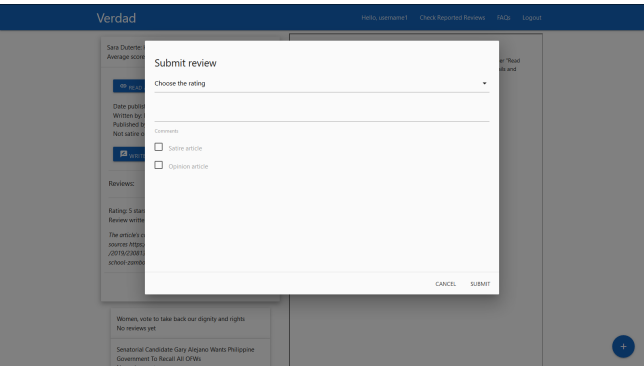
Article submission



Reviewer sign up



Reviewer profile



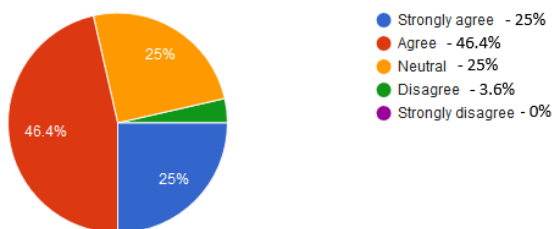
Review submission

- PhilStar, Inquirer and Manila Bulletin
- 24 oras
- Inquirer, Rappler
- cnn
- CNN, BBC
- Rappler, Inquirer, Manila Bulletin
- Philippine inquirer
- CNN, INQ
- Tv patrol
- Thinking Pinoy

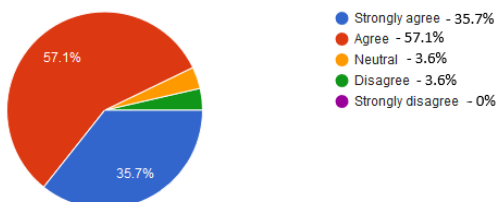
Which news outlets/publishers do you distrust the most?
(Leave blank if none)

- Facebook
- ABS-CBN
- Rappler
- Trending News Portal
- PTV 4
- CNN, LOCA NEWS REPORT
- Abante and Bulgar
- Social media
- Tv patrol
- Anything tabloid and partisan
- Buzzfeed news lol
- Manila Bulletin
- Mocha Uson Blog
- MOCHA USON BLOG! Pinoy ako blog! Thinking Pinoy!
- ABS-CBN

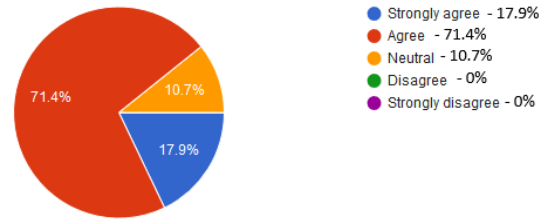
Do you agree that Verdad's user interface is well-designed?



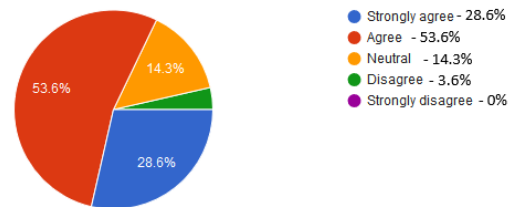
Do you agree that signing up to Verdad as a user was fast and easy?



Do you agree that articles and reviews were easy to read?



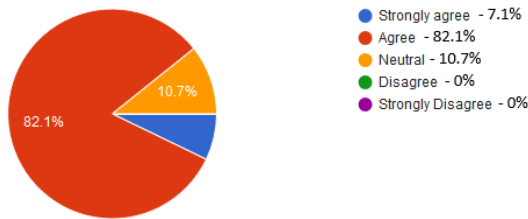
Do you agree that the system is overall easy to use?



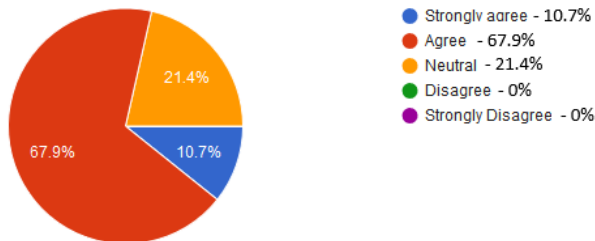
Do you have any suggestions for Verdad's user experience?

- Redesign the interface. Forms looked too big and fields needed re-ordering. Article selection is good but needs to be refined. Having a summary of the article may be a good thing to add.
- None
- UI is simple, loading/slowness is an issue but understandable
- Create a better layout or design for the site. Make it more attractive to the eyes of the reader though its simplicity is still nice
- To be eye catching
- Website should be more attractive for the users would encourage to view the site.
- For Verification of acc . it would be easy if you use captcha pic first and eventually the email verification.
- got lost in the interface at first use. got confused if i signed up as a reviewer or reader at first (was trying to review an article).
- Maybe let the user choose whether or not to sign in/register as user/reviewer in main page and have usage prompts for first-time users ala tutorial to make it even easier for them to navigate thru the site.
- (Just my personal preference) Perhaps a broader window for viewing the articles. Otherwise, everything looks good.
- Usability of the tool should be revisited. Mix and match of colors. Modals should be designed well. Font is not too okay. Not too appealing although it is an 'okay' site
- During registration, there's a pop up page that doesn't really give or lack information. Less experienced users might get confused on how to go forward, but overall it's great.

Do you agree that articles were given appropriate reviews and ratings depending on their truthfulness?



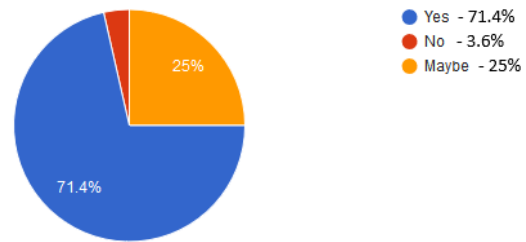
Do you agree that Verdad, as a peer review system for news articles, is able to filter out fake news and other kinds of misinformation in media?



What do you think of Verdad overall?

- Good
- It can be developed into a great platform for news. Good reviewers must be recognized by an upvote-downvote system but not limited to that. There must be reviewers that are publicly verifiable for their credibility.
- Great. Its full potential can be seen when there are more users engaging in article reviews.
- Reliable fact-checking website. Highly recommendable.
- An effective site that can filter out misleading and unauthentic news articles online.
- Fast loading
- it's well-designed
- I think it is a great initiative.
- good concept, concerned about scalability, user adoption, and content integrity
- I think this is a great idea. Kudos to the developer for thinking of this and for making sure this works seamlessly.
- Nice
- It looks promising. The interface is quite user-friendly as well.
- Informative
- The objective is clear, to sort out fake news in the internet.
- Verdad has good positive points but it needs innovative strategy to be appealing to reviewers
- 8 out of 10

Would you suggest using Verdad to people that you know?



Do you have any suggestions to make Verdad more effective?

- For now, having good reviewers will be a great start. Adding public news figures as reviewers will make this a bit more credible than just having normal users.
- Its already simple and effective, aside from managing duplicate articles. Next thing is make the user feel the site is reliable and unbiased, though not sure how to do that
- Website should be more attractive for the users would encourage to view the site.
- For Verification of acc . it would be easy if you use captcha pic first and eventually the email verification.
- create some form of browser plugin that displays verdad review data when reviewed article is in display
- None
- Machine Learning, UI/UX changes, More content, Notifications, Increase of Karma per review
- Need to make use of the site more to be able to offer suggestions.

APPENDIX C REVIEWER TEST RESULTS

- Respondent 1: AB Communication Arts Student
 - Article reviewed: The Largest Wind Farm in SE Asia Opens in the Philippines
 - Article URL: <https://www.choosephilippines.com/go/heritage-sites/2076/burgos-wind-farm-ilocos-norte/>
 - Researcher's expected response: 4 out of 5
 - Researcher's source: <https://www.philstar.com/headlines/2019/04/08/1908354/not-just-hot-air-ilocos-norte-does-have-biggest-wind-farm-region>
 - Respondent's rating: 5 out of 5
 - Respondent's review: I already knew that Ilocos Norte was home to some of the largest windmill farms in the Philippines so I had a hunch that this was true. The information shared in the article didn't sound questionable, exaggerated or inconsistent. If checked on google, you'll see that a similar article was published by Philstar. Given that, it seems we can confirm that this article is not fake news. <https://www.philstar.com/headlines/2019/04/08/1908354/not-just-hot-air-ilocos-norte-does-have-biggest-wind-farm-region>
- Respondent 2: AB Sociology Student
 - Article reviewed: Sara Duterte: Honesty should not be an election issue

- Article URL: <https://news.abs-cbn.com/news/03/06/19/sara-duterte-honesty-should-not-be-an-election-issue>
- Researcher's expected response: 2 or 3 out of 5, article is accurate but statement is misleading
- Researcher's source: <https://www.rappler.com/newsbreak/fact-check/225363-misleading-sara-duterte-says-law-does-not-require-senators-honest>
- Respondent's rating: 5 out of 5
- Respondent's review: The article's content is consistent with articles from different sources <https://www.rappler.com/nation/politics/elections/2019/230813-fire-hits-vote-counting-machines-stored-school-zamboanga-del-sur-may-15>
- Respondent 3: BS Computer Science Student
 - Article reviewed: Is it a sin not to vote for Otso Diretso? No, it's not
 - Article URL: <https://www.manilatimes.net/is-it-a-sin-not-to-vote-for-otso-diretso-no-its-not/538468/>
 - Researcher's expected response: Tagged as opinion
 - Researcher's source: Article explicitly states that it is an opinion article.
 - Respondent's rating: 1 out of 5
 - Misinformation on Diokno's and Macalintal's backgrounds. They have, and still are, serving the government. (Diokno: <https://www.gmanetwork.com/news/eleksyon2019/candidate/24/josemanueladeodiokno/>) (Macalintal: <https://www.gmanetwork.com/news/eleksyon2019/candidate/40/romulomacalintal/>) Colmenares have always been accused of sympathizing with the New People's Army (NPA), but as he had said, whenever one disagrees with the government, they are immediately tagged as rebels. (<http://tnt.abante.com.ph/colmenares-hindi-ako-komunista1/>)
 - Respondent's article tag: Opinion