# https://www.gapgyan.org/



#### **GAP GYAN**

#### A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)

Impact Factor - SJIF - 4.998, IIFS - 4.375 Globally peer-reviewed and open access journal.



## CHALLENGES OF SOCIAL MEDIA: A COMPREHENSIVE OVERVIEW OF THE LITERATURE ON INDIAN CULTURE

#### Mohammad Khalid Khawrin, Ahmad Nabi Stanikzai

Assistant professor at the Department of Judgement and Prosecution, Faculty of Law and Political Science, Kunduz University, Afghanistan mk.ahmadzai@yahoo.com / mk.khawreen@gujaratuniversity.ac.in https://orcid.org/0000-0003-3313-2061

Department of Finance and Banking, Faculty of Economy, Kunduz University, Afghanistan ahmadnabist@gmail.com

#### **Abstract**

Social media has had a significant influence on Indian culture and has been assimilated into the fabric of Indian society. By identifying and comprehending the issues social media pose to Indian culture, it can be useful to design strategies to decrease their negative effects and promote constructive use of them. The website utilized for the search and the search query words was the Scopus search engine. In total, 752 papers were located throughout the search. An effective method for conducting systematic literature reviews that enables the inclusion of a diversity of studies and viewpoints is the utilization of open-source secondary data. VOSviewer version 1.6.19 was the research analysis tool employed for the data analysis. Three hundred four item codes in all were included in the analysis. The items were divided into three clusters based on their similarities. In the network visualization, the first cluster, indicated by the color red, is the largest and consists of 120 items. The cluster represents the most prevalent social media problems that Indian culture encounters. The difficulties in this cluster include anxiety, burden, death, sadness, difficulty, disease, fear, mental health issues, misinformation, public health, danger, and stress. Items that were represented by the color green makeup cluster 112, which is made up of them. The third cluster contained 72 pieces and was represented by the color blue.

Keywords: Misinformation, fake news, Cyberbullying, Privacy concerns, Addiction, Social inequality

#### 1. INTRODUCTION

The widespread use of social media has had a profound effect on several facets of life, including communication, politics, commerce, and education. Important channels for communication, education, and treatment are provided by the new social media (Frankish et al., 2012; M. Khawrin et al., 2022). Social media has become an essential component of contemporary society. The use of social media is increasing and has an impact on all facets of modern society (Dubose, 2011). Even if social media offers numerous advantages, there are several drawbacks to using it, particularly in the context of Indian culture. One way to clarify some of the major difficulties with social media in this setting is to do a rigorous literature review of Indian culture. For instance, Misinformation and fake news, Cyberbullying, Privacy concerns, Addiction, Social inequality. These are just a handful of the difficulties Indian society faces with social media. Additional problems include the propagation of hate speech, the sexism of social media, and online harassment of women. To solve these issues, better regulation, education, and awareness efforts to encourage safe social media use are required.

#### 2. LITERATURE REVIEW

Social media has become an essential component of contemporary life, and usage has skyrocketed in recent years. However, because of its widespread usage, both individuals and society as a whole face several difficulties. Several of the major issues with social media, such as cyberbullying, the dissemination of fake news, privacy concerns, addiction, and online harassment, are highlighted in a thorough assessment of the literature on Indian culture. India, a nation with a diverse population, faces a particular set of difficulties when it comes to using social media. According to a systematic literature review, the dissemination of misinformation, the use of social media for political propaganda, hate speech and cyberbullying, privacy concerns, and the effect of social media on mental health are just a few of the challenges that are unique to India (Bali & Desai, 2019; M. Khawrin et al., 2021; Kozyreva et al., 2020; Wang et al., 2019, 2019). One of the biggest issues with social media is cyberbullying, which involves a variety of types of harassment like trolling and spreading unpleasant

## https://www.gapgyan.or

#### **GAP GYAN**

#### A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)





comments and messages that can seriously disturb the victim on a mental and emotional level (El Asam & Samara, 2016; M. Khawrin, 2022; Rosli et al., 2021).

Another big issue with social media is the proliferation of fake news, which can lead to widespread anxiety, social unrest, and even violence (M. K. Khawrin, 2023, 2023; Mugari, 2020; Zhang & Ghorbani, 2020). Social media platforms' massive collection of user personal data, which can be shared with outside businesses and used for targeted advertising, has also raised privacy issues (Selwyn & Pangrazio, 2018).

Another issue that can result in social isolation, despair, and anxiety is social media addiction (Kuss & Griffiths, 2017). Finally, social media has spawned online harassment, which can take many different forms and contribute to an increase in cybercrime. Examples of this harassment include hate speech, body shaming, and harassment based on gender (Chetty & Alathur, 2018).

In India, spreading false information or fake news online has become a serious problem that has contributed to various violent occurrences and social turmoil (Pulido et al., 2020). Furthermore, in India, where political parties use social media to disseminate their message and target certain voters, the use of social media for political propaganda is a serious concern (Till, 2021). In addition, in India, hate speech and cyberbullying are common on social media, and the nation has passed legislation to stop and penalize such activity (Harasgama & Rathnayaka, 2021; Hayward, 2011; Tripathi, 2017).

Another major issue in India is privacy, so the nation has implemented regulations to control data protection and privacy on social media platforms (Kaufman, 2009). The impact of social media on mental health, particularly among young people, is an increasing worry in India. Studies have shown that using social media negatively affects mental health (Gassó et al., 2019).

In conclusion, India's use of social media presents several special difficulties. To address these issues, a comprehensive strategy that promotes appropriate social media use through education, awareness campaigns, and laws is needed. To properly utilize social media, it is essential to be aware of the difficulties that it presents. In order to address these issues and encourage ethical usage of social media, education, and awareness initiatives can be quite helpful (Dwivedi et al., 2021).

#### RESEARCH PROBLEMS

GRAND ACADEMIC PORTAL

Research problems that may arise when conducting a systematic literature review on the challenges of social media in Indian culture include:

The research problem for the topic "Challenges of social media: a systematic literature review of Indian Culture" is the lack of sufficient research that can provide a generalization about the challenges of social media in India. Despite the growing popularity of social media platforms in India, there is still limited research that comprehensively examines the challenges associated with their use. As a result, there is a gap in knowledge about how social media affects Indian culture and society, particularly in the context of the challenges it presents. This research seeks to address this gap in knowledge by conducting a systematic literature review of the available Scopus research engine literature on the challenges of social media in Indian culture.

#### **RESEARCH OBJECTIVES**

The research objectives for a systematic literature review of Indian Culture on the challenges of social media include the following:

- 1. To identify and review the Scopus research engine available literature on the challenges of social media in Indian culture.
- 2. To explore the challenges of social media in Indian culture.

#### RESEARCH QUESTIONS

The research questions for a systematic literature review of Indian Culture on the challenges of social media are as below:

- 1. What is the available literature on the challenges of social media in Indian culture according to the Scopus research engine?
- 2. What are the challenges faced by Indian culture in regards to social media?

#### 3. METHODOLOGY

The methodology used in this study was a systematic literature review of Indian Culture. A systematic literature review is a research method that involves the identification, selection, and critical appraisal of all relevant studies on a specific topic (M. Khawrin & Nderego, 2022). The primary objective of this method is to provide a comprehensive and unbiased summary of the existing literature on a particular subject. In this study, an exhaustive search was conducted using the Scopus search engine to identify all relevant articles and conference papers on the challenges of social media in India. The search was conducted using specific search terms and criteria to ensure that all relevant studies were captured.

The next step involved the screening of the identified studies to eliminate duplicates and irrelevant studies. The remaining studies were then critically appraised to assess their quality and relevance to the research question.



#### **GAP GYAN**

#### A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)





The data extracted from the studies were then synthesized and analyzed to identify patterns, trends, and research gaps.

The systematic literature review method used in this study allowed for a comprehensive assessment of the state of the field's knowledge on the challenges of social media in India. The findings of this study provide a critical analysis of the existing literature on this subject and identify areas where further research is needed.

#### 3.1 DATA COLLECTION

Data collection for this study involved the use of open-source secondary data obtained from the Scopus search engine on 6th of April 2023. The website used for the search was Scopus search engine, and the search command terms were as follows: Challenge or Obstacle or Difficulty or Hurdle or Barrier or Dilemma or Conundrum or Problem or Impediment or Hardship or Opposition and "social media" or "Online networking platforms" or "Digital communication channels" or "Social networks" or "Web communities" or "Internet forums" or "Virtual communities" or "Web-based socializing" or "Digital socializing" or "Online interaction" or "Electronic communication channels" and "India" or "Indian Culture".

The time range considered for the search was from 2000 to 2023, and all subject areas were included in the search. The document types included in the search were articles and conference papers. The total number of documents obtained from the search was 752. The file type downloaded for the obtained documents was RIS. The use of open-source secondary data is an effective method for conducting systematic literature reviews and allows for the inclusion of a wide range of studies and perspectives. The search terms used in this study were carefully selected to capture all possible documents related to the challenges of social media in India, and the time range considered allowed for the inclusion of recent studies in this field.

#### 3.2 RESEARCH ANALYSIS TOOL

For the analysis of the obtained data, VOSviewer version 1.6.19 was used as the research analysis tool. A total of 304 items codes were included in the analysis. The items were divided into three clusters based on their similarities (see Figure 1), with the first cluster being red with 120 items, the second cluster being green with 112 items, and the third cluster being blue with 72 items.

The analysis involved three types of visualization: network visualization, overlay visualization, and item density visualization. Network visualization is a graphical representation of the connections between the different items in the clusters. Overlay visualization involves the superimposition of different maps to reveal the overlapping items in the clusters. Item density visualization, on the other hand, shows the density of items in a cluster using a color gradient.

The use of VOSviewer as the research analysis tool allowed for the identification of patterns and relationships among the different items in the clusters, making it easier to draw conclusions and make recommendations based on the findings. This tool is widely used in research analysis and has proven to be effective in identifying and visualizing relationships between different variables.

#### 4. RESULT

The analysis of the collected data using VOSviewer software resulted in a total of 304 items that were divided into three distinct clusters (see Figure 1). The first cluster, represented by the color red, contained 120 items. The second cluster, represented by the color green, contained 112 items, and the third cluster, represented by the color blue, contained 72 items.

The analysis of clusters provides a visual representation of the trends, patterns, and research gaps in the literature. It helps in identifying the common themes and issues addressed in the literature and their relationships. Overall, the cluster analysis provides valuable insights into the challenges of social media in Indian culture, which are shown below.

Table 1: Challenges in red cluster with its total links and occurrence

Red cluster challenges	Total links strength	Occurrence
anxiety	427	26
burden	401	26
death	159	15
depression	438	28
difficulty	504	40
disease	810	54
fear	338	23
mental health	303	23
mental health problem	135	10
misinformation	182	16
public health	152	12



### GAP GYAN A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)

Impact Factor – SJIF – 4.998, IIFS - 4.375 Globally peer-reviewed and open access journal.



risk	847	66
stress	401	21

Table 1 shows the first cluster, represented by the color red, contains 120 items and is the largest cluster in the network visualization. The cluster represents the most common challenges of social media in Indian culture. The challenges identified in this cluster are anxiety, burden, death, depression, difficulty, disease, fear, mental health, mental health problem, misinformation, public health, risk, and stress.

The challenges indicate a strong relationship between the keywords. The occurrence of the keywords ranges from 10 to 66 times in the identified literature. The most commonly occurring keywords in this cluster are difficulty, disease, and risk.

The keyword "difficulty" occurs 40 times in the identified literature and is related to the challenges faced by individuals in using social media effectively. The challenges include managing online privacy, dealing with online harassment, and navigating online content.

The keyword "disease" occurs 54 times in the identified literature and is related to the impact of social media on physical health. The challenges include the spread of misinformation related to health, the impact of social media on mental health, and the promotion of unhealthy behaviors.

The keyword "risk" occurs 66 times in the identified literature and is related to the potential risks associated with the use of social media. The challenges include cyberbullying, online harassment, and the spread of fake news.

Other keywords in the cluster include anxiety, depression, and stress, which are related to the impact of social media on mental health. Misinformation is also a significant challenge identified in this cluster, indicating the need for improved information literacy and critical thinking skills.

Overall, the challenges identified in the first cluster highlight the complex and multifaceted nature of social media use in Indian culture and the need for effective strategies to address these challenges.

Table 2: Challenges in green cluster with its total links and occurrence

Green cluster challenges	Total links strength	Occurrence
complexity	122	12
crime	163	16
culture	569	47
discrimination	206	16
ict	166	13
identity	374	34
inequality	203	17
loss	295	24
mass	260	20
opposition	114	13
religion	144	12
security	301	23
violence	352	31
vulnerability	192	11

Table 2 showed that the second cluster, represented by the color green, contained 112 items. The challenges identified in this cluster include complexity (12 occurrences with total link strength of 122), crime (16 occurrences with total link strength of 163), culture (47 occurrences with total link strength of 569), discrimination (16 occurrences with total link strength of 206), ICT (13 occurrences with total link strength of 166), identity (34 occurrences with total link strength of 374), inequality (17 occurrences with total link strength of 203), loss (24 occurrences with total link strength of 295), mass (20 occurrences with total link strength of 140), opposition (13 occurrences with total link strength of 114), religion (12 occurrences with total link strength of 301), violence (31 occurrences with total link strength of 352), and vulnerability (11 occurrences with total link strength of 192).

Table 3: Challenges in Blue cluster with its total links and occurrence

Blue cluster challenges	Total links strength	Occurrence
fake news	100	12
LOT (Lack of Trust)	154	12
political party	149	14
sentiment	349	28

Table 3 showed that the third cluster, represented by the color blue, contained 72 items. The challenges identified in this cluster included fake news, LOT (Lack of Trust), political party, and sentiment. The total links



### **GAP GYAN**A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)





strength for fake news was 100, occurring in 12 items. The total links strength for LOT was 154, occurring in 12 items. The total links strength for political party was 149, occurring in 14 items. Finally, the total links strength for sentiment was 349, occurring in 28 items.

Figure 1 Network visualization

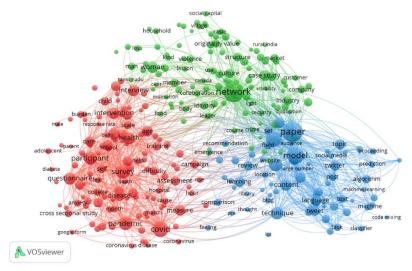
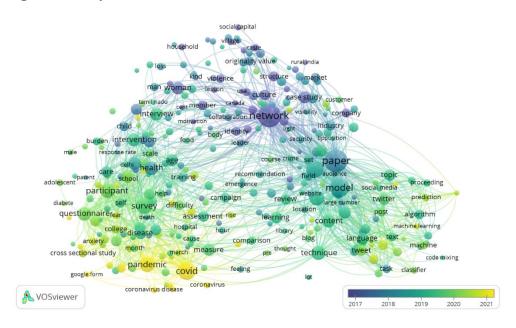


Figure 1 depicts the network visualization in VOSviewer, which provides a visual representation of the relationships between the identified literature based on the similarity of their keywords. The above figure shows the network visualization of the 304 items that were identified in the literature review of the challenges of social media in Indian culture. The figure shows that the literature is divided into three distinct clusters, represented by different colors.

The first cluster, represented by the color red, contains the highest number of items and is located at the left of the figure. This indicates that the keywords in this cluster are the most commonly used in the identified literature and are related to the core themes of the research. The second cluster, represented by the color green, is located on the center side of the figure and contains keywords that are related to the second most common themes in the identified literature. The third cluster, represented by the color blue, is located on the right side of the figure and contains keywords that are related to the least common themes in the identified literature.

The thickness of the lines connecting the nodes represents the strength of the relationships between the keywords. The closer the nodes are to each other, the more closely related they are. The visualization provides a useful tool for identifying the relationships between the different themes and issues addressed in the literature on the challenges of social media in Indian culture.

Figure 2 Overlay visualization



# https://www.gapgyan.org/



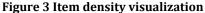
### GAP GYAN A GLOBAL JOURNAL OF SOCIAL SCIENCES

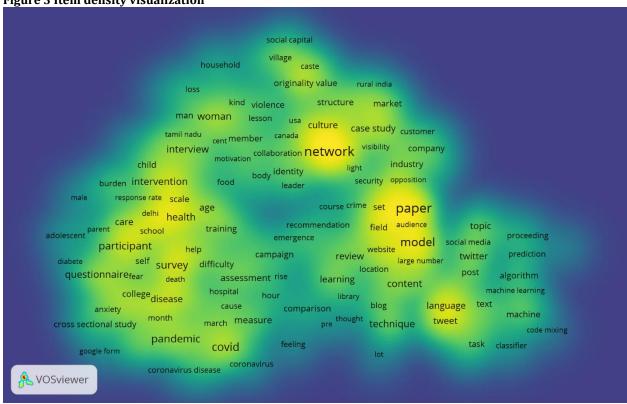
(ISSN - 2581-5830)





The overlay visualization in Figure 2 provides a color-coded representation of the scores of items. The color of an item is determined by its score, with blue indicating the lowest publication and yellow indicating the highest publication. In addition, a color bar is displayed in the bottom right corner of the visualization, which helps in interpreting the mapping of scores to colors. In this particular overlay visualization, the colors represent the year of publication of the journals in which the items were published. The visualization provides a useful way to understand how the scores and publication years of the items are related to each other.





The item density visualization, as shown in Figure 3, provides a graphical representation of the density of items in the research dataset. The visualization presents a scatterplot of the items, where each point represents an item and the color of the point indicates the density of items in the neighborhood of that point. The color scale ranges from blue to green to yellow, with blue representing low density and yellow representing high density. In the item density visualization, points with similar densities are grouped together, forming clusters of items with similar characteristics. The size of the clusters depends on the number of items in the dataset with similar densities.

The item density visualization is useful for identifying patterns and trends in the data, as well as for identifying areas with high and low density of research on a particular topic. It can help researchers to focus on areas with low research density and to identify research gaps that need to be filled.

#### 5. SUMMARY

The largest cluster in the network visualization, represented by the color red, contains 120 items and represents the most common challenges of social media in Indian culture. Keywords such as difficulty, disease, and risk occur most frequently, indicating challenges related to effective social media use, impact on physical and mental health, and potential risks associated with social media. Other challenges identified include anxiety, depression, stress, and misinformation, emphasizing the need for improved information literacy and critical thinking skills. Overall, these challenges highlight the complex nature of social media use in Indian culture and the need for effective strategies to address them.

The second cluster, represented by the color green, contains 112 items and focuses on the challenges of social media in Indian culture, including complexity, crime, culture, discrimination, ICT, identity, inequality, loss, mass, opposition, religion, security, violence, and vulnerability. The cluster highlights the diverse and complex nature of the challenges faced in social media use in India, including issues related to culture, identity, and security.

The third cluster in the systematic literature review on the challenges of social media in Indian culture was represented by the color blue and contained 72 items. The main challenges identified in this cluster included fake news, LOT (Lack of Trust), political party, and sentiment. Fake news occurred in 12 items with a total link

# https://www.gapgyan.org/

#### **GAP GYAN**



#### A GLOBAL JOURNAL OF SOCIAL SCIENCES

( ISSN - 2581-5830 )





strength of 100, LOT occurred in 12 items with a total link strength of 154, political party occurred in 14 items with a total link strength of 149, and sentiment occurred in 28 items with a total link strength of 349. These challenges highlight the importance of trust, credibility, and objectivity in social media content in Indian culture.

#### 6. RECOMMENDATIONS

In order to comprehend the causes and find a solution, it is necessary to investigate how social media affects mental health in Indian society. The rise of fake news on social media in Indian culture must be examined since it affects every aspect of the political, social, and economic climate of the entire nation. Examine the social media access and the digital gap in Indian culture to diagnose the weak Indian society. Finally, it is crucial to research how social media use affects public health in Indian culture.

#### 7. REFERENCES

- [1] Bali, A., & Desai, P. (2019). Fake News and Social Media: Indian Perspective. Media Watch, 10(3), 737–750. https://doi.org/10.15655/mw/2019/v10i3/49687
- [2] Chetty, N., & Alathur, S. (2018). Hate speech review in the context of online social networks. Aggression and Violent Behavior, 40, 108–118. https://doi.org/10.1016/j.avb.2018.05.003
- [3] Dubose, C. O. (2011). The social media revolution. Radiologic Technology, 83(2), 112-119.
- [4] Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A. S., Kumar, V., Rahman, M. M., Raman, R., Rauschnabel, P. A., Rowley, J., Salo, J., Tran, G. A., & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. International Journal of Information Management, 59, 1–37. https://doi.org/10.1016/j.ijinfomgt.2020.102168
- [5] El Asam, A., & Samara, M. (2016). Cyberbullying and the law: A review of psychological and legal challenges. Computers in Human Behavior, 65, 127–141. https://doi.org/10.1016/j.chb.2016.08.012
- [6] Frankish, K., Ryan, C., & Harris, A. (2012). Psychiatry and online social media: Potential, pitfalls and ethical guidelines for psychiatrists and trainees. Australasian Psychiatry, 20(3), 181–187. https://doi.org/10.1177/1039856212447881
- [7] Gassó, A. M., Klettke, B., Agustina, J. R., & Montiel, I. (2019). Sexting, Mental Health, and Victimization Among Adolescents: A Literature Review. International Journal of Environmental Research and Public Health, 16(13), Article 13. https://doi.org/10.3390/ijerph16132364
- [8] Harasgama, K. S., & Rathnayaka, H. B. (2021). Combatting Cyber-Bullying: An Analysis of Laws in India, Singapore, and Sri Lanka. KDU Law Journal, 1, 127.
- [9] Hayward, J. O. (2011). Anti-Cyber Bullying Statutes: Threat to Student Free Speech. Cleveland State Law Review, 59, 85.
- [10] Kaufman, L. M. (2009). Data Security in the World of Cloud Computing. IEEE Security & Privacy, 7(4), 61–64. https://doi.org/10.1109/MSP.2009.87
- [11] Khawrin, M. (2022). An Assessment of Cyberbullying Behavior among Gujarat University Students in Relation to Gender, Age, and Internet Surfing. International Journal of Social Sciences, 10(4), 390–395.
- [12] Khawrin, M. K. (2023). Ethnocentrism as a Predictor of Cyberbullying & Cyber Victimization among adults: A Cross-Cultural Study [Gujarat University]. https://doi.org/10.5281/zenodo.7833310
- [13] Khawrin, M., Mathur, K., & Kumar, K. (2021). Afghan Ethnicities and Internet Surfing Correlate with Digital Bullying and Victimization. Towards Excellence, 13(4), 449–4460. https://doi.org/10.37867/TE130441
- [14] Khawrin, M., Mathur, K., & Kumar, K. (2022). Relationship of Selected Cyberbullying Behaviors among Gujarat University Students. GAP INDIAN JOURNAL OF FORENSICS AND BEHAVIOURAL SCIENCES, 3(2), 14–21. https://doi.org/10.5281/zenodo.7235666
- [15] Khawrin, M., & Nderego, E. (2022). Psychological Challenges of Cyberspace: A Systematical Review of Metaanalysis. Indian Journal of Health and Well-Being, 13(3), 294–300. https://doi.org/10.5281/zenodo.7163803
- [16] Kozyreva, A., Lewandowsky, S., & Hertwig, R. (2020). Citizens Versus the Internet: Confronting Digital Challenges With Cognitive Tools. Psychological Science in the Public Interest, 21(3), 103–156. https://doi.org/10.1177/1529100620946707

### GRAND ACADEMIC PORTAL

#### **GAP GYAN**

#### A GLOBAL JOURNAL OF SOCIAL SCIENCES

(ISSN - 2581-5830)





- [17] Kuss, D. J., & Griffiths, M. D. (2017). Social Networking Sites and Addiction: Ten Lessons Learned. International Journal of Environmental Research and Public Health, 14(3), Article 3. https://doi.org/10.3390/ijerph14030311
- [18] Mugari, I. (2020). The dark side of social media in Zimbabwe: Unpacking the legal framework conundrum. Cogent Social Sciences, 6(1), 1–15. https://doi.org/10.1080/23311886.2020.1825058
- [19] Pulido, C. M., Ruiz-Eugenio, L., Redondo-Sama, G., & Villarejo-Carballido, B. (2020). A New Application of Social Impact in Social Media for Overcoming Fake News in Health. International Journal of Environmental Research and Public Health, 17(7), Article 7. https://doi.org/10.3390/ijerph17072430
- [20] Rosli, W. R. W., Ya'cob, S. N., Bakar, M. H. A., & Bajury, M. S. M. (2021). Governing the Risks of Cyber Bullying in the Workplace During the Era of Covid-19. Malaysian Journal of Social Sciences and Humanities (MJSSH), 6(10), Article 10. https://doi.org/10.47405/mjssh.v6i10.1079
- [21] Selwyn, N., & Pangrazio, L. (2018). Doing data differently? Developing personal data tactics and strategies amongst young mobile media users. Big Data & Society, 5(1), 1–12. https://doi.org/10.1177/2053951718765021
- [22] Till, C. (2021). Propaganda through 'reflexive control' and the mediated construction of reality. New Media & Society, 23(6), 1362–1378. https://doi.org/10.1177/1461444820902446
- [23] Tripathi, V. (2017). Youth Violence and Social Media. Journal of Social Sciences, 52(1–3), 1–7. https://doi.org/10.1080/09718923.2017.1352614
- [24] Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic Literature Review on the Spread of Health-related Misinformation on Social Media. Social Science & Medicine (1982), 240, 112552. https://doi.org/10.1016/j.socscimed.2019.112552
- [25] Zhang, X., & Ghorbani, A. A. (2020). An overview of online fake news: Characterization, detection, and discussion. Information Processing & Management, 57(2), 1–26. https://doi.org/10.1016/j.ipm.2019.03.004