Chapter

Communication through Social Media: Fake or Reality

Arshia Kaul and Ritika Guaba

Abstract

Coronavirus Disease 2019 (COVID-19), a pandemic has shaken the entire world. While the think tanks across nations are fighting hard to find a solution to Covid-19, the spread of Infodemic is making the handling of crisis even more complicated. When the control of a deadly disease like COVID-19 depends on the actions of the population, the quality of information the individuals are being exposed too becomes a vital concern. It is alarming to see that even at a time when the truth can become a matter of life and death a multitude of false information is being spread on social media making it all the more difficult for governments to control the crisis. Plethora of research agrees to an electronic grapevine being more destructive than anything previously imaginable. However, identifying which Social Media Platform is most likely to activate and spread the grapevine is not addressed by any study. This study uses the Fuzzy TOPSIS approach and identifies Facebook followed by WhatsApp as the two platforms most likely to spread infodemic in the country. The quantification of evaluation of the Platforms in spreading misinformation will facilitate the government to take accurate measures to stop the spread of misinformation from the identified platforms.

Keywords: Covid-19, Crisis, Infodemic, Social Media Platforms, Fuzzy Topsis, Facebook, WhatsApp

1. Introduction

Coronavirus Disease 2019 (COVID-19), a pandemic has shaken the entire world. The outbreak which initiated in December 2019 from the city of Wuhan in China [1, 2] within four months has spread like wildfire to 210 countries infecting almost 6,403,001 people. (data as of 2nd June 2020).

The disease with an unknown etiology has clogged the healthcare machinery of even the most medically advanced nations [3]. COVID-19 spreads through human to human contact [1, 4]. The fact that the disease can even be transmitted through asymptomatic patients [5] makes it highly infectious [6]. With no pharmaceutical intervention yet, even the developed countries are at the mercy of social distancing [7] to protect their citizens from the fatal virus.

When the control of a deadly disease like Covid-19 depends on the actions of the population, the quality of information the individuals are being exposed to becomes a vital concern. It is alarming to see that even at a time when the truth can become a matter of life and death a multitude of false information is being spread on social media [8].

Social Media Platforms (SMP) like Facebook, Twitter, WhatsApp, Instagram, Linkedin were originally developed with the intention to connect people [9]. However, with speedier data networks and cheaper smart phones a majority of individuals now use these platforms to gather news and information from across the globe. Thus, social media plays a fundamental role in the news fruition.

Social Media in the current times have become an essential publishing platform for journalists (Zubiaga, et, al.). The journalists use the platform not only to report breaking news [10] but also to determine public opinions and to ascertain potential stories [11]. According to Social Media today has become a central platform for both news dissemination and consumption by journalists and individuals. Citizens follow the development of breaking news and events either through the official social media handles of various news channels or through posts of their own network (e.g. friends, family, and public figures).

Indeed, social networks can be extremely useful particularly during crisis like Covid- 19, because of their inherent ability to spread vital news much faster than traditional media [12]. However, this positive impact of social media comes at a cost. The absence of fact-checking and control over posts/ messages makes social media a fertile ground for breeding of misinformation. People often publish posts or share other messages without verifying either the genesis or reliability of the information. Oftentimes, a catchy headline is sufficient for an article to be shared thousands of times, despite it possibly being incorrect.

COVID-19 spread into India through travelers from abroad in the first week of March 2020. Accompanying the disease was infodemic related to Covid-19, which entered the country with an even mightier force. Infodemic such as COVID-19 being a Bio-Weapon declaration of emergency due to the pandemic in India (Press Trust of India, 2020), the disease would not survive in summers, a particular community purposely spreading Corona, steam inhalation and drinking warm water will kill the virus; are just a few examples of the infodemic spread in India. The term infodemic has been coined to outline the hazard of misinformation during the management of pandemics like COVID-19. Since it could even speed up the virus spreads process by influencing and fragmenting social response, controlling an infodemic becomes an additional challenge for all governments.

Numerous studies provide evidence for the spread of misinformation through Social Media [11]. Studies have also been conducted to analyze the spread of infodemic during crises through Social Media platforms [13]; Leung, and Huang, 2007). Research has been conducted to understand the pattern, speed and impact of misinformation spread both during pandemics and otherwise too [12, 14, 15]. Most of the studies conducted on the spread of fake news through Social Media platforms are generic in nature. None of the research so far attempts to identify any one social media platform which has a higher possibility of spreading fake news.

Research Question: Is there any one platform which is more likely to spread Infodemic as compared to other SMP?

Several efforts are being made by the government and the various SMP to curb the spread of fake news in the country. However the increasing number of SMPs and a billion plus users in the country makes fact checking of post/ message a mammoth task. In such a scenario if the SMP which is most likely medium of maximum misinformation is identified, it will help authorities to control infodemic.

The paper further includes the theoretical background, motivation for the study, case study and analysis using Fuzzy-Technique of Order Preference by Similarity to Ideal Solution (F-TOPSIS) methodology. The paper ends with discussion and suggestions for future scope of studies.

2. Theoretical background

The growth of the online social media platforms, have facilitated both- communication and dissemination of real-time information among people across the world [15]. With the characteristics of low cost, ease-of-use, and rapid rate, social media platforms have become the major stage for online social interaction and information transmission [16].

However, in recent times the platforms which were created with the intention of connecting and informing have become a hub of misinformation and fake news [11]. According to [12] the social media platforms (SMP) are an ideal breeding ground for circulating misleading or false news, political statements, advertisements, and even rumors. These platforms become particularly more fertile and active during a crisis. During times of worry individuals are more susceptible in believing any information that they come across. COVID-19 is one such crisis that the misinformation reapers are taking advantage off.

According to a report published by the Reuters Institute for the Study of Journalism at the University of Oxford more than one third of the social media users across Europe and USA have come across a misleading information related to COVID-19. The misinformation, fake news that is spread specifically during epidemic and pandemics through the social media is known as infodemic.

Infodemic is particularly hazardous as it hampers with the government intervention and also fragments the social responses. Infodemic adds to the anxiety and panic of the individuals making them more exposed to the dangers of the pandemic. Often infodemic speeds up the rate of spread of disease.

Studies reveal that four out of five individuals have shared online at least one news story that they later found out was inaccurate or fake. A study conducted by Common Sense Media revealed that even Generation-Z who practically live their life of internet are confused when it comes to identifying true from fake [14]. Further, it is revealed by [17] that people get influenced even by that information on the internet that they perceive as unreliable. In a survey conducted on the Indian population during lockdown revealed that a majority Indians agree to reading, often, fake or incorrect information about Covid-19 online. What was flabbergasting was that the same set of people still considered online as their major source of information.

A large amount of online fake news has the potential to cause serious problems in society specifically during global crisis like Covid- 19 [11]. On social networks, the reach and effects of information spread occur at such a swift pace and so augmented that the fake, distorted or inaccurate information acquires a remarkable potential to cause a catastrophes within minutes, for millions of users [18]. Some studies pointed out that fake news and inaccurate information may spread faster and wider than fact-based news particularly during calamity [11].

In recent years, there has been extensive research on establishing an effective and automatic framework for online fake news detection [19]. Identifying credible social information from millions of messages, however, is challenging, due to the heterogeneous and dynamic nature of online social communication [20].

Controlling all the Social Media Platforms collectively is a challenge. Studies claim that all SMP do not spread fake news with the same vigor. Thus, a model to forecast that Social Media Platforms that is most likely to spread maximum fake news can help authorities to curb infodemic and misinformation.

3. Research gap and motivation

The studies conducted on social Media misinformation can be broadly classified into three categories. The first comprises ofstudies that attempt to comprehend the variety of misinformation, its pattern of spread and its interaction with individuals [9, 11, 21, 22]. The second category comprised of all the studies that either describe or design methods to detect online fake news [16, 17, 20, 23, 24]. Considering the threat misinformation can be during crises like Covid-19, the third category comprises of studies conducted to analyze the impact and spread of misinformation during crises and pandemics [13].

Across studies related to misinformation, all the Social Media Platforms (SMPs) are regarded as one. Even though studies agree that the effect and strength of misinformation might be platform-specific. To fill this gap, this study using of F-TOPSIS method attempts to create a mathematical model to identify those social media platforms which are most likely to spread Infodemic.

4. Methods of research

In this section we describe the methodology that is used in the paper for ranking of SMP in order of their ability to spread misinformation. Here, we have used Fuzzy Technique for Order Preference by Similarity to Ideal Solution (F-TOPSIS) method. This being the extension of TOPSIS to incorporate the real-life decision making. The alternatives (here SMPs) should be such that each alternative is at the shortest distance from the ideal (best) solution and farthest distance from the negative-ideal solution (worst) possible in the given problem scenario [25].

Considering the concept of TOPSIS, Chen [26] proposed the variant of TOPSIS method under fuzzy environment. The method was proposed to incorporate the real-life inability to make decisions on exact quantification. The basic structure of F-TOPSIS is described in **Figure 1**.

Many researchers have discussed the applications of F-TOPSIS in various fields. Evaluation of initial training for aircraft in Taiwanese Air Force Academy was

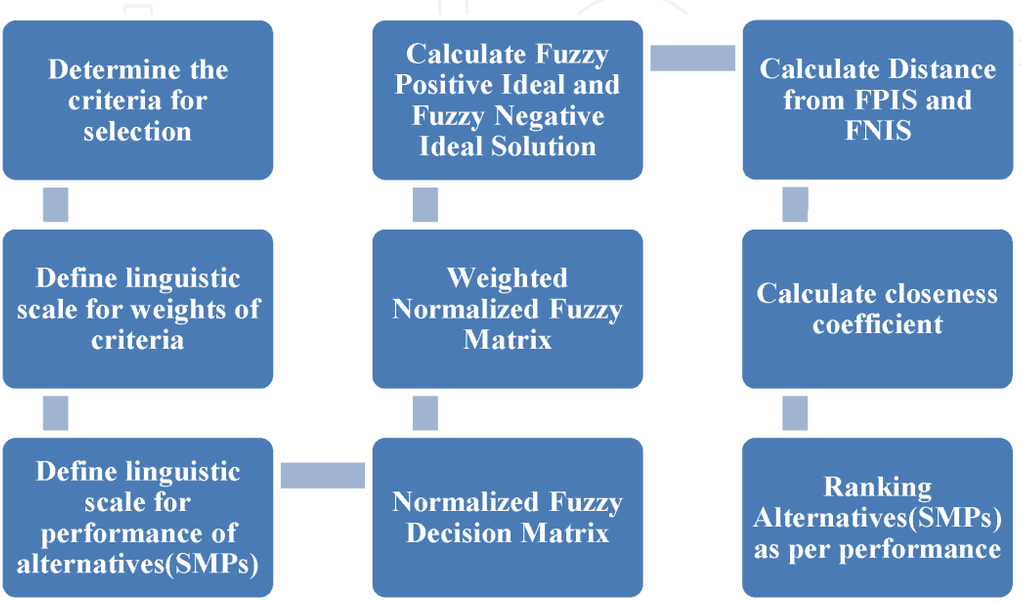

Figure 1.
Fuzzy-TOPSIS methodology. Source: Adapted from Chen [7].

discussed by Wang and Chang using F-TOPSIS. In Amiri the selection of project for the National Iranian Oil company has been done through the hybrid methodology of AHP and F-TOPSIS. AHP is used to calculate the weights of the criteria and F-TOPSIS for the final ranking of the alternatives. Awasthi et al. discussed the selection of sustainable transport system under the case where there is incomplete information. They carried out the selection through the F-TOPSIS method. Ashrafzadeh et al. discuss the application of the method for the case of selection of warehouse. To the best of our knowledge there are no studies which have quantified the spread misinformation in F-MCDM. Moreover, F- TOPSIS has not been used. This technique is used due to its simplicity in understanding, computational comprehension, easy method of selection and ranking of alternatives under consideration.

5. Case study

It is evident from the extant literature that Social Media Platforms (SMPs) extensively contribute to spread of misinformation. The question that arises is that which out of the many available are most likely to increase the spread of misinformation. In this section the focus is to give the details of the mathematical methodology viz. F-TOPSIS, for ranking of SMPs in decreasing order of their ability to spread misinformation.

For a real case for a situation of decision making there are always conflicting conditions under which the decision has to be taken. To come up with best decision it is believed that quantitative methods are more accurate. On the other hand one cannot ignore the subjectivity in real life cases. A good blend of quantitative decision making with inclusion of subjectivity is the Fuzzy-Multi Criteria Decision Making (F-MCDM). In this research we try and rank the Social Media Platforms (SMPs) in order to understand the role of each platform in spreading misinformation.

5.1 Steps of F-TOPSIS for ranking of SMP

For basic conceptual understanding of fuzzy set evaluations the reader could refer Chen [26]. Moreover, the F-TOPSIS methodology used has also been proposed by Chen [26]. The steps that can be used for ranking of the SMPs through F-TOPSIS are as follows:

- ***Step 1***: In the first step a choice of criteria for evaluation (j = 1,2,...,n') (here n' = 9) for evaluating the alternatives (i = 1,2,...,m') (here m' = 7) in connection with ranking in decreasing order of ability of each SMP in spreading misinformation. These criteria for evaluation were finalized by experts in the field based on extensive research of extant literature. **Table 1** below describes the criteria for evaluation.

- ***Step 2***: As proposed by Chen [26], linguistic scales for assigning weights to criteria(as defined in **Table 1**) and for performance evaluation of alternatives with respect to criteria are defined in the form of Triangular Fuzzy Numbers (TFNs) (Refer **Table A1** and **Table A2** in appendix).

Note: It must be noted that in this study triangular fuzzy numbers have been used since they are easier to use and calculations becomes easier for decision makers. Further it has proven to be more effective in situations where the information available is imprecise and subjective.

Criteria for evaluation	Working definition	Reference
Majority people in my circle use this SMP	To check belief in news based on friendly influence	Khan et al. [27]; Shu et al. [28]; Bernal [29].
I can easily share any post or message on this SMP	To check ease with which the message can be relayed	Khan et al. [27]; Shu et al. [28]
Most users of this SMP are very active	Influence of frequency of use by the users on the spread of misinformation	Khan et al. [27]; Shu et al. [28]
This SMP pins the location of all my posts	Influence of location identification on spread	Khan et al. [27]; Shu et al. [28]
I get access to a lot of intellectual content on this SMP	Misinformation may spread disguised, interspersed with serious content.	Khan et al. [27]; Shu et al. [28]
Even a person with minimum technical skill can use this SMP easily	Ease of spread due to user friendly platform	Khan et al. [27]; Shu et al. [28]
This SMP lets me have conversations easily even with strangers .	Interaction with non-trusted source	Khan et al. [27]; Shu et al. [28]
I often find myself hooked on this SMP	Addictive nature of SMP which influences to believe in all information (user believes in it blindly)	Khan et al. [27]; Shu et al. [28]
I often see/ receive posts/articles/ messages of my interest on SMP	Influence based on interest and so the user is impacted easily	Khan et al. [27]; Shu et al. [28]; Bernal [29]

Table 1.
Criteria for evaluation of social media platform.

- ***Step 3***: A group of k decision makers (here assessment is based on SMP users) (k = 1,2,..., K) (K = 40). These 40 have been empanelled for study. This study is part of larger project. The panel will be used for future studies as well. The panel is asked to give suitable weights for the j^{th}criteria. The average weights for each criterion and performance of alternatives w.r.t. to each criterion from the group are obtained using the formula for average of K = 40 decision makers. The 40 people empanelled were people working in different organizations and having different experience in years ranging from 10 to 20 years. They were part of marketing, operations, human resource departments. The data was collected to take their opinion from the period May 2020 onwards during the lockdown period in most countries.

- ***Step 4***: Based on the average performance values of each SMP from the group of decision makers the final fuzzy decision matrix and the corresponding vector of weights can be defined as given in **Table 2**.

- ***Step 5(a)***: To preserve the property of a TFN to lie in the range [0,1] normalization is carried out. The normalized matrix is given in **Table A3** in appendix. The components of the normalized matrix are obtained by the formula given Chen [26].

- ***Step 5(b)***: The weight of each criterion is multiplied to the normalized performance values of the SMP with respect to each criterion through multiplication rule of fuzzy numbers. The outcome matrix of this step is called the fuzzy normalized weighted matrix The components of the normalized weighted matrix are given in **Table A4** in appendix (refer [26])

Weights	**(0.79,0.935,0.99)**	**(0.8,0.95,1)**	**(0.78,0.94,1)**	**(0.58,0.78,0.94)**	**(0.69,0.865,0.97)**	**(0.6,0.8,0.95)**	**(0.72,0.94,0.94)**	**(0.79,0.92,1)**	**(0.6,0.8,0.95)**
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
Facebook	(5.94,7.23,7.92)	(3.89,5.26,6.44)	(4.34,5.89,7.18)	(4.31,5.81,7.05)	(2.71,4.10,5.55)	(5.42,6.73,7.63)	(4.44,5.86,7.02)	(3.89,5.34,6.55)	(4.65,6.21,7.31)
WhatsApp	(7.92,9,9.18)	(6.89,8.13,8.63)	(7.18,8.4,8.94)	(3.39,4.60,5.84)	(3.34,4.81,6.26)	(6.63,8.02,8.71)	(4,5.28,6.42)	(5.5,6.9,8)	(4.15,5.71,7.05)
Twitter	(1.15,1.97,2.76)	(1.60,2.42,3.23)	(1.39,2.21,3.02)	(1.23,2.02,2.81)	(1.57,2.36,3.15)	(0.94,1.52,2.26)	(1.65,2.44,3.15)	(1.07,1.76,2.5)	(1.39,2.15,2.86)
LinkedIn	(3.76,5,5.94)	(3.71,4.94,5.94)	(3.05,4.34,5.47)	(2.15,3.26,4.44)	(4.44,5.60,6.34)	(2.21,3.15,4.28)	(3.18,4.34,5.34)	(2.52,3.55,4.63)	(4.23,5.44,6.21)
Instagram	(3.60,4.81,5.73)	(3.23,4.28,5.26)	(3.55,4.76,5.71)	(3.131,4.28,5.31)	(1.65,2.76,4.05)	(2.73,3.86,4.94)	(2.28,3.42,4.57)	(3.26,4.42,5.42)	(2.97,4.05,5.05)
Tik-Tok	(1.60,2.21,2.73)	(1.07,1.60,2.15)	(1.60,2.18,2.65)	(0.84,1.31,1.89)	(0.57,0.89,1.42)	(2,2.5,2.84)	(1.10,1.55,2.05)	(1.36,1.78,2.21)	(1.36,1.73,2.10)
YouTube	(5.86,6.84,7.28)	(3.28,4.57,5.68)	(4.39,5.81,6.84)	(2.68,3.89,5.10)	(5.31,6.44,7.15)	(5.26,6.65,7.47)	(3.89,5.10,6.02)	(4.55,5.84,6.73)	(5.60,6.81,7.39)

Table 2.
Fuzzy decision matrix.

S. No	Social media platforms	
1.	Facebook	0.801542
2.	WhatsApp	0.752068
3.	Twitter	0.552188
4.	LinkedIn	0.518083
5.	YouTube	0.398945
6.	Tik-Tok	0.393162
7.	Instagram	0.316925

Table 3.
Closeness coefficient.

- ***Step 6***: Then the Fuzzy Positive Ideal Solution (FPIS) and the Fuzzy Negative Ideal Solution (FNIS) is calculated

  FPIS = A^* = (1,1,1).

  FNIS = A^* = (0,0,0)

- ***Step 7***: The distance from the FPIS (d_i^*) and that from FNIS (d_i^-) for each of the SMPs is given in **Table A5** in appendix.

- ***Step 8(a)***: Closeness coefficient (CC_i) for each SMP is calculated and given in **Table 3**.

- ***Step 8 (b)***: The closer the value of $CC_i$is to unity the better the alternative. Arranging (CC_i) values in descending order we obtain the top ranked alternatives.

6. Results and discussion

The progress from type writer to smart phones, from newspapers to social media walls have contributed to the ease of freedom of speech in the true spirit. However, on the flip side this freedom and ease has also enabled the fabrication and spread of misinformation like never before [29].

On social platforms, misinformation disseminates at an extremely swift pace and with such an augmented impact that the fake, distorted or inaccurate information acquires a remarkable potential to cause a devastation catastrophe within minutes [16]. The production and circulation of fake news and inaccurate information becomes even more rampant and destructive during crisis like Covid-19 [30].

A crisis makes people hungry for information, hungry for certitude. More mysterious the crisis stronger is the hunger [30]. In a survey conducted across six countries in the month of April 2020 it was revealed that in all the countries people use social media platforms to satisfy the hunger of information and certitude about Covid 19 [31].

Like the world over even Indian use Social Media Platforms as their major source of information for Covid 19. According to a recent report by the fact checking website BOOM, COVID-19 related misinformation and rumors which began

souring in the third week of March 2020 and took a colossal spike in early April 2020, the same time period when India went under Lockdown [32].

The aim of this paper was to identify and rank in descending order, Social Media Platforms (SMPs) ability to spread misinformation. The research attempted to identify the SMP which according to the users are most responsible for spread of misinformation. In the paper proxy measures in the form of criteria were used to rank the SMPs. The criteria were termed as proxy measures as the end users filled up the survey based on a blind review. The users were asked to analyze each of the SMP w.r.t. each criterion without biasing their responses towards spread of misinformation.

As discussed in the previous section, the users are asked to give their ranks based on fuzzy linguistic scale to establish the performance (ability to spread) w.r.t to criteria.

The results reveal Facebook followed by WhatsApp and Twitter as the three top most SMP most likely to spread misinformation. The results corroborate with previous research that identify Facebook as tailor-made for the spreading of fake news and for political manipulation [29]. The author further states that Facebook combines all the essential characteristics for the design, creation, targeting and promulgation of fake news. In another study conducted by Princeton University it was revealed that Facebook is the worst perpetrator when it comes to disseminating misinformation. It is much ahead of both YouTube and Twitter when it comes to spreading of fake news or infodemic [33]. The study further states that Facebook aids those wishing to spread 'fake news', by providing them with tools and incentives to do so.

Facebook-owned WhatsApp is the next media most likely to spread infodemic. According to a research [34] WhatsApp is most popular social media platform in India, with over 400 million users in the country, thus making it a significant platform for the spread of infodemic. It is worth noting that the three major catastrophes related to COVID-19 that took place in India during the lockdown phase, in all three infodemic were majorly spread through WhatsApp. First the Palghar mob lynching case on the 16th April 2020 [35]. In the next incident misunderstanding caused by infodemic led to a series of violent attacks on health care professionals in Indore [36]. The most precarious out of all the incidents instigated by fake news was the one that depicted an entire community as vector of disease. In all the three WhatsApp had a major role to play in the spread of infodemic. Thus, confirming the results of the study. Supporting the study is the research titled *WhatsApp Vigilantes: An exploration of citizen reception and circulation of WhatsApp misinformation linked to mob violence in India* conducted by London School of Economics and political Science. The study innumerate's the role of WhatsApp in spreading of fake information leading to various mob lynching incidents in India.

Some other factors contributed to the likely hood of the two platforms spreading maximum fake news are the number and age group of users; degree of rural and urban user penetration and nature of posts.

Facebook and WhatsApp have the one of highest number of users in India, 300 million and 200 million respectively. Being the oldest social media website[1] Facebook has users of all generations[2] and even from rural India. Anyone who uses

[1] Orkut was launched in 2008 followed by Facebook, Orkut was ultimately closed down in 2014.

[2] https://www.statista.com/statistics/376128/facebook-global-user-age-distribution/

a smart phone has WhatsApp installed, thus is used by people of all age group and demographics [37].

Although, more than 50 percent of social media users in India use Twitter, however the platform is yet not very popular both among the rural and older age users. Moreover, there are restrictions on the number of words, size of the Video that can be tweeted making it less attractive to Indians. YouTube has the highest number of users in India, however unlike Facebook and WhatsApp where messages, videos, photographs all can be shared, on YouTube only videos can be shared. Similar is the case with Instagram, which is a Photo and video sharing App. LinkedIn though originally developed as a professional networking site is slowly gaining popularity among its users. Just like Facebook and WhastApp, any kind of content can be shared on this platform too. However this platform is not popular among the rural users.

The Indians who found it difficult to express themselves through neatly worded tweets or self-appreciating captions on Instagram posts found solace in Tik Tok. Reports suggest that a large section of India's first-time internet users—some of them illiterate, others speaking in local dialects—find navigating video-based platforms Tik Tok easier and addictive. However being just two years old in India and with only 30 seconds video posts, as per the results of the study, the platform is less likely to spread fake news.

7. Conclusion

The crisis of COVID-19 has already killed millions across the globe. The pandemic has further left a large number of people jobless and almost the entire world hopeless. While the think tanks across nations are fighting hard to find a solution to Covid- 19, the spread of Infodemic is making the handling of crisis even more complicated.

When the control of a deadly disease like Covid-19 depends on the actions of the population, the quality of information the individuals are being exposed too becomes a vital concern. It is alarming to see that even at a time when the truth can become a matter of life and death a multitude of false information is being spread on social media making it all the more difficult for governments to control the crises.

Plethora of research agree to the an electronic grapevine being more destructive than anything previously imaginable, which Social Media Platform is most likely to activate and spread the grapevine is not addressed by any study.

This study using the Fuzzy-TOPSIS approach identifies Facebook and Whatsapp as the two medium most likely to spread infodemic in the country. The study has enabled to objectively quantify the Social Media Platforms which in turn will facilitate the government to take more accurate decisions to stop the spread of misinformation from the identified platforms.

The identification of the aforesaid media will also help the platforms to take decisions on how to change the features of their SMP so to ensure reduction of spread of misinformation. The changes in the features can be undertaken either by the platforms themselves or educating the platform users.

8. Limitations of the study

The limitations of the current study will lead to future scope. In the current study we have taken only a small group of decision makers based on whose opinion

and judgment we have been able to come to an exploratory conclusion. Further, in this study we have only considered a limited number of SMPs which are considered which may be considered for the spread of misinformation, there could be other media which may also be responsible for spread of misinformation.

In future cross border studies can be carried on to identify if the same platforms are responsible in spreading misinformation in all the countries, or are there any variations. Also, the above study was carried out specifically during COVID-19, post the crisis another study can be carried out to see if the same platforms are responsible for the spread of misinformation yet or do the results vary. This can be a longitudinal study to the current research. We may also include different media for our analysis.

Appendix

Linguistic variables for giving order of preferences of criteria	Corresponding TFN
Very Low (VL)	(0,0,0.1)
Low(L)	(0,0.1,0.3)
Medium Low(ML)	(0.1,0.3,0.5)
Medium(M)	(0.3,0.5,0.7)
Medium High(MH)	(0.5,0.7,0.9)
High(H)	(0.7,0.9,1.0)
Very High(VH)	(0.9,1.0,1.0)

Table A1.
Linguistic scale for weights of criteria.

Linguistic variables for determining performance of SMPw.r.t. criteria	Corresponding TFN
Very poor (VP)	(0,0,1)
Poor(P)	(0,1,3)
Medium Poor(MP)	(1,3,5)
Fair(F)	(3,5,7)
Medium Good(MG)	(5,7,9)
Good(G)	(7,9,10)
Very Good(VG)	(9,10,10)

Table A2.
Linguistic scale for performance of alternatives (SMP).

Weights	**(0.79,0.935,0.99)**	**(0.8,0.95,1)**	**(0.78,0.94,1)**	**(0.58,0.78,0.94)**	**(0.69,0.865,0.97)**	**(0.6,0.8,0.95)**	**(0.72,0.94,0.94)**	**(0.79,0.92,1)**	**(0.6,0.8,0.95)**
	C1	C2	C3	C4	C5	C6	C7	C8	C9
Facebook	(0.64,0.78,0.86)	(0.45,0.60,0.74)	(0.48,0.65,0.80)	(0.61,0.82,1)	(0.378,0.57,0.77)	(0.62,0.77,0.87)	(0.63,0.83,1)	(0.48,0.66,0.81)	(0.62,0.83,0.98)
WhatsApp	(0.86,0.97,1)	(0.79,0.94,1)	(0.80,0.94,1)	(0.48,0.65,0.82)	(0.46,0.67,0.875)	(0.76,0.92,1)	(0.56,0.75,0.91)	(0.68,0.87,1)	(0.56,0.77,0.95)
Twitter	(0.12,0.21,0.30)	(0.18,0.28,0.375)	(0.15,0.24,0.33)	(0.17,0.28,0.39)	(0.22,0.33,0.44)	(0.10,0.17,0.25)	(0.23,0.34,0.44)	(0.13,0.22,0.3125)	(0.18,0.29,0.38)
LinkedIn	(0.40,0.54,0.64)	(0.42,0.57,0.68)	(0.34,0.48,0.61)	(0.30,0.46,0.63)	(0.621,0.78,0.88)	(0.25,0.36,0.49)	(0.45,0.61,0.76)	(0.31,0.44,0.57)	(0.57,0.73,0.83)
Instagram	(0.39,0.52,0.62)	(0.37,0.49,0.60)	(0.39,0.53,0.63)	(0.44,0.60,0.75)	(0.23,0.38,0.56)	(0.31,0.44,0.56)	(0.32,0.48,0.65)	(0.40,0.55,0.67)	(0.40,0.54,0.68)
Tik-Tok	(0.17,0.24,0.29)	(0.12,0.18,0.25)	(0.17,0.24,0.29)	(0.11,0.18,0.26)	(0.08,0.12,0.19)	(0.22,0.28,0.32)	(0.15,0.22,0.29)	(0.17,0.22,0.27)	(0.18,0.23,0.28)
YouTube	(0.63,0.74,0.79)	(0.38,0.53,0.65)	(0.49,0.65,0.76)	(0.38,0.55,0.72)	(0.74,0.90,1)	(0.60,0.76,0.85)	(0.55,0.72,0.85)	(0.56,0.73,0.84)	(0.75,0.92,1)

Table A3.
Normalized fuzzy decision matrix.

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
Facebook	(0.51,0.73,0.85)	(0.36,0.57,0.74)	(0.37,0.61,0.80)	(0.35,0.64,0.94)	(0.26,0.49,0.75)	(0.37,0.61,0.83)	(0.45,0.78,0.94)	(0.38,0.61,0.81)	(0.37,0.67,0.93)
WhatsApp	(0.68,0.91,0.99)	(0.63,0.89,1)	(0.62,0.89,1)	(0.27,0.50,0.77)	(0.32,0.58,0.84)	(0.45,0.73,0.95)	(0.40,0.70,0.85)	(0.54,0.80,1)	(0.33,0.61,0.90)
Twitter	(0.099,0.20,0.29)	(0.14,0.26,0.375)	(0.12,0.23,0.33)	(0.10,0.22,0.37)	(0.15,0.28,0.42)	(0.06,0.14,0.24)	(0.16,0.32,0.42)	(0.10,0.20,0.31)	(0.11,0.23,0.36)
LinkedIn	(0.32,0.50,0.64)	(0.34,0.54,0.68)	(0.26,0.45,0.61)	(0.17,0.36,0.59)	(0.42,0.67,0.85)	(0.15,0.29,0.46)	(0.32,0.58,0.71)	(0.24,0.40,0.57)	(0.34,0.58,0.79)
Instagram	(0.31,0.49,0.61)	(0.3,0.47,0.60)	(0.30,0.50,0.63)	(0.25,0.47,0.70)	(0.15,0.33,0.54)	(0.18,0.35,0.53)	(0.23,0.45,0.61)	(0.32,0.50,0.67)	(0.24,0.43,0.64)
Tik-Tok	(0.13,0.22,0.29)	(0.1,0.17,0.25)	(0.13,0.22,0.29)	(0.06,0.14,0.25)	(0.05,0.10,0.19)	(0.13,0.22,0.30)	(0.11,0.20,0.27)	(0.13,0.20,0.27)	(0.11,0.18,0.27)
YouTube	(0.50,0.69,0.78)	(0.30,0.50,0.65)	(0.38,0.61,0.76)	(0.22,0.43,0.68)	(0.51,0.77,0.97)	(0.36,0.61,0.81)	(0.39,0.68,0.80)	(0.44,0.67,0.84)	(0.45,0.73,0.95)

Table A4.
Weighted normalized fuzzy decision matrix.

S. No	Social Media Platforms	d_i^*	d_i^-
1.	Facebook	3.808774	5.878767
2.	WhatsApp	3.090532	6.661095
3.	Twitter	6.935459	2.286388
4.	LinkedIn	4.886222	4.54513
5.	Instagram	5.193706	4.211984
6.	Tik-Tok	7.311769	1.810359
7.	YouTube	3.810798	5.741397

Table A5.
Distance from FPIS and FNIS.

Author details

Arshia Kaul[1] and Ritika Guaba[2*]

1 ASMSOC, NMIMS University, Mumbai, India

2 Zenith PhD. Training and Consultancy, India

*Address all correspondence to: drritikagauba@gmail.com

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