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Research Article

Comparative Diffusion Dynamics of Fake News on Facebook and WhatsApp: A Network-Based and Behavioral Analysis

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Abstract

The rapid expansion of social media platforms has transformed the way information is created, shared, and consumed. However, this digital transformation has also facilitated the unprecedented spread of fake news, particularly on platforms like Facebook and WhatsApp. The present study attempts to comparatively analyse the diffusion dynamics of fake news on Facebook and WhatsApp using a network-based and behavioural framework. A representative sample of 200 active social media users was selected through stratified random sampling. The study employed a structured questionnaire along with simulated message-tracking exercises to measure sharing behaviour, forwarding patterns, and verification tendencies. Statistical techniques such as mean, standard deviation, correlation, regression analysis, and independent sample t-test were used for data analysis. The findings reveal significant differences in the diffusion speed, network reach, and behavioural motivations of fake news sharing across both platforms. While Facebook exhibits broader and more visible cascades due to algorithmic amplification, WhatsApp demonstrates deeper penetration within closed networks due to encrypted peer-to-peer forwarding. The study concludes that platform architecture significantly influences misinformation diffusion patterns and user behaviour.

KEYWORDS: Fake News, Diffusion Dynamics, Social Network Analysis, Algorithmic Amplification, Forwarding Behaviour.

1. INTRODUCTION

In the contemporary digital era, social media platforms have emerged as primary sources of news and information, fundamentally transforming the architecture of public communication. The transition from traditional mass media to digital and networked media ecosystems has altered not only how information is produced but also how it is circulated and consumed. Platforms such as Facebook and WhatsApp have revolutionised communication by enabling instant sharing of multimedia content—text, images, videos, hyperlinks, and live streams—across geographical, cultural, and political boundaries. With billions of active users globally, these platforms function as digital public spheres where individuals participate in content creation, commentary, and dissemination. While such participatory affordances enhance democratic engagement and decentralise information production, they simultaneously create fertile ground for the proliferation of misinformation and fake news.

Fake news refers to fabricated, manipulated, or misleading information presented in the format of legitimate news with the deliberate intention to deceive, misinform, or influence public opinion. Unlike satire or unintentional inaccuracies, fake news is strategically crafted to resemble credible journalism in order to gain trust and maximise circulation. The economic logic of digital media—where attention, engagement, and virality are rewarded—further incentivises sensational and emotionally charged content. In traditional media systems, editorial gatekeeping mechanisms, professional norms, and regulatory frameworks act as filters to verify information before publication. However, social media platforms operate on participatory and algorithm-driven models that allow users to generate, modify, and disseminate content with minimal pre-publication scrutiny. This structural shift from centralised gatekeeping to distributed sharing significantly increases the speed and scale at which misinformation can spread.

Facebook functions as a relatively open networked platform where posts may be shared publicly, liked, reacted to, and commented upon, thereby increasing visibility through algorithmic recommendation systems. Its news feed algorithm prioritises content based on engagement metrics such as shares, reactions, watch time, and interaction history. As a result, content that evokes strong emotional responses—anger, fear, outrage, or excitement—tends to receive greater amplification. This algorithmic curation can unintentionally privilege sensational or misleading information over verified but less emotionally stimulating news. Moreover, the public nature of Facebook's network structure allows fake news to generate broad cascades, reaching diverse audiences beyond the source's immediate social circle. Influencers, pages, and groups further accelerate diffusion by acting as hubs within the network.

In contrast, WhatsApp operates primarily as a closed, encrypted messaging service where information spreads through private chats, groups, and broadcast lists. Its end-to-end encryption ensures user privacy but also limits external monitoring and content moderation. The forwarding feature enables rapid peer-to-peer transmission of messages, often accompanied by multimedia attachments. Unlike Facebook's algorithmic feed, WhatsApp's diffusion is driven by interpersonal trust and social proximity. Messages received from family members, friends, or community groups are often perceived as credible due to relational trust rather than source verification. This structure facilitates deeper penetration within tightly knit social networks, making misinformation resistant to correction once embedded within private group conversations. The absence of visible public counterspeech further reduces opportunities for collective fact-checking.

These structural differences between Facebook and WhatsApp significantly influence how fake news diffuses across users. On Facebook, diffusion may be broader and more visible, shaped by algorithmic amplification and public engagement metrics. On WhatsApp, diffusion may be faster within closed clusters, reinforced by trust-based sharing and limited traceability. In both cases, user behaviour plays a crucial role. Psychological factors such as confirmation bias, ideological alignment, emotional arousal, perceived credibility, and digital literacy levels interact with platform architecture to determine whether a piece of misinformation is ignored, questioned, or forwarded.

The present study critically examines how platform architecture and user behaviour interact to shape the diffusion dynamics of fake news on Facebook and WhatsApp. By adopting a comparative network-based and behavioural approach, the study seeks to analyse differences in speed, reach, cascade patterns, and verification tendencies across both platforms. Understanding these dynamics is essential not only for academic inquiry but also for policy formulation, digital literacy interventions, and the development of effective misinformation mitigation strategies in an increasingly interconnected digital society.

Scheme of the Paper

The research paper has been organised into six sections:
Section I: Introduction of the problem
Section II: Review of related literature
Section III: Objectives, hypotheses, database and research methodology
Section IV: Analysis and interpretation of data
Section V: Conclusions and implications
Section VI: Suggestions for further research

2. REVIEW OF RELATED LITERATURE

The phenomenon of fake news and misinformation on digital platforms has attracted significant scholarly attention over the past decade. Researchers from communication studies, political science, data science, and psychology have examined the structural, technological, and behavioural dimensions of misinformation diffusion.

One of the most influential empirical investigations into misinformation diffusion was conducted by Soroush Vosoughi, Deb Roy, and Sinan Aral (2018), who analysed large-scale Twitter data and found that false news spreads significantly faster, deeper, and more broadly than true news. Their study demonstrated that novelty and emotional reactions—

particularly surprise and disgust—contributed to higher diffusion rates. Although conducted on Twitter, the findings provided a theoretical foundation for understanding misinformation cascades across social media platforms.

Similarly, David Lazer et al. (2018) emphasised that the architecture of social media platforms plays a crucial role in accelerating misinformation. They argued that algorithmic ranking systems, low barriers to content creation, and the absence of editorial gatekeeping create an ecosystem where misinformation can thrive. Their work underscored the need for interdisciplinary approaches to study the science of fake news.

Research specifically focusing on Facebook has examined the role of algorithmic curation and engagement-driven amplification. Bakshy, Messing, and Adamic (2015) found that Facebook's algorithm influences exposure to ideologically aligned content, contributing to selective exposure and echo chambers. Allcott and Gentzkow (2017) analysed fake news consumption during the 2016 U.S. Presidential Election and concluded that social media significantly contributed to the dissemination of politically misleading information. Further, studies have shown that public metrics such as likes, shares, and comments increase perceived credibility and visibility, thereby facilitating viral cascades.

On the other hand, research on WhatsApp has primarily focused on its encrypted and closed-network structure. Unlike open platforms, WhatsApp operates through private chats and groups protected by end-to-end encryption. Scholars have observed that misinformation spreads rapidly within such networks because of strong-tie relationships and interpersonal trust. Studies conducted in countries like India and Brazil have highlighted how political rumours and communal misinformation circulated widely through WhatsApp groups, often leading to real-world consequences. The forwarding feature and group messaging architecture enable rapid peer-to-peer transmission, while limited traceability reduces accountability.

Behavioural research further complements structural analyses. Gordon Pennycook and David Rand (2019) argued that susceptibility to fake news is often linked more to a lack of analytical reasoning than to purely ideological bias. Their findings suggest that cognitive reflection and digital literacy significantly reduce the likelihood of sharing misinformation. Other scholars have highlighted the role of confirmation bias, motivated reasoning, emotional arousal, and perceived source credibility in influencing sharing behaviour.

Network-based studies emphasise the importance of highly connected users or "hubs" in amplifying misinformation cascades. Influencers, administrators of large groups, and politically motivated actors often function as key nodes that accelerate diffusion. Computational propaganda research has also documented the strategic use of coordinated networks and automated accounts to enhance the reach of misleading content.

Despite the substantial body of literature on misinformation diffusion, most studies focus on single-platform analysis, particularly Twitter or Facebook. Comparatively fewer empirical investigations examine WhatsApp due to data accessibility challenges arising from encryption. Moreover, limited research integrates both structural (platform architecture, algorithmic amplification, network topology) and behavioural (psychological motivations, trust, verification tendency) variables within a unified comparative framework.

Therefore, while existing literature provides valuable insights into the mechanisms of misinformation spread, a comprehensive comparative analysis of diffusion dynamics across Facebook and WhatsApp remains underexplored. The present study seeks to bridge this gap by adopting a network-based and behavioural approach to comparatively examine how platform architecture and user psychology interact to shape fake news proliferation across both platforms.

Research Gap

From the review of literature, it is evident that while separate studies exist on misinformation diffusion on Facebook and WhatsApp, comparative empirical research analysing both platforms simultaneously using network and behavioural variables is limited. Moreover, few studies integrate structural platform features with psychological determinants of sharing behaviour. Therefore, the investigator undertook this study to comparatively analyse fake news diffusion dynamics on Facebook and WhatsApp.

3. OBJECTIVES

The present study was undertaken with the following objectives:
1. To compare the diffusion speed of fake news on Facebook and WhatsApp.
2. To analyse the network reach of fake news across both platforms.
3. To examine behavioural factors influencing fake news sharing.
4. To assess verification tendencies among users.
5. To evaluate the role of platform architecture in misinformation proliferation.

Hypotheses

H1: There is a significant difference in the diffusion speed of fake news between Facebook and WhatsApp.

H2: There is a significant difference in the network reach of fake news between Facebook and WhatsApp.

H3: Behavioural motivations significantly predict fake news sharing behaviour.

H4: Verification tendency negatively correlates with fake news forwarding behaviour.

Focus Area

The study focuses on active social media users residing in urban and semi-urban regions of Punjab.

Data Collection Work

Primary data were collected from 200 respondents using a standardised Fake News Sharing Behaviour Scale developed and validated by the investigator. The tool consisted of 30 items measuring forwarding frequency, emotional triggers, trust

perception, and verification behaviour. Reliability coefficient (Cronbach's Alpha) was found to be 0.86.

Statistical Techniques
Mean, Standard Deviation, Independent Sample t-test, Pearson Correlation, and Multiple Regression Analysis were used for statistical analysis.

4.   RESEARCH METHODOLOGY
Research Design
A comparative descriptive research design was adopted.

Sample Design
A sample of 200 active users (100 Facebook users and 100 WhatsApp users) was selected through stratified random sampling.

Time Period
The data were collected over a period of two months.

Parameters of the Study
- Diffusion Speed
- Network Reach
- Forwarding Frequency
- Verification Behaviour
- Emotional Motivation

5.   FINDINGS AND DISCUSSION
The present section analyses and interprets the data collected to examine the comparative diffusion dynamics of fake news on Facebook and WhatsApp. The findings are discussed in relation to the objectives and hypotheses of the study.

Table 1: Showing Comparison of Diffusion Speed of Fake News

Platform	Mean	SD	t-Value	Significance
Facebook	28.45	4.62	3.98	Significant at 1%
WhatsApp	31.12	4.85		

The above table presents the comparative analysis of the diffusion speed of fake news across Facebook and WhatsApp. The mean score for WhatsApp (31.12) is significantly higher than that of Facebook (28.45). The calculated t-value of 3.98 is significant at the 1% level, indicating a statistically significant difference between the two platforms.

These findings suggest that fake news spreads more rapidly on WhatsApp than on Facebook. This can be attributed to WhatsApp's peer-to-peer forwarding mechanism, which enables instant sharing of messages within private chats and groups. The forwarding feature allows users to disseminate content to multiple contacts simultaneously without the friction of public scrutiny. Additionally, strong interpersonal trust within closed networks accelerates message acceptance and retransmission.

In contrast, although Facebook also allows rapid sharing, the visibility of posts in public spaces sometimes invites counter-comments, fact-checking links, or corrective responses that may

slow down diffusion. Therefore, the structural design of WhatsApp appears to facilitate faster short-term diffusion compared to Facebook.

Table 2: Showing Comparison of Network Reach

Platform	Mean	SD	t-Value	Significance
Facebook	35.67	5.12	4.21	Significant at 1%
WhatsApp	29.34	4.73		

Table 2 shows the comparison of the network reach of fake news on both platforms. The mean network reach score for Facebook (35.67) is considerably higher than that of WhatsApp (29.34). The t-value of 4.21 is significant at the 1% level, indicating a statistically significant difference.

This finding demonstrates that while WhatsApp facilitates faster diffusion, Facebook ensures broader visibility and larger audience reach. Facebook's algorithmic amplification system promotes highly engaged content to wider networks beyond immediate contacts. Public sharing options, pages, and groups enable misinformation to transcend local clusters and reach heterogeneous audiences.

On WhatsApp, diffusion largely remains confined within closed groups and personal networks. Although messages may circulate intensely within clusters, their reach is typically limited to connected nodes unless repeatedly forwarded across multiple groups. Hence, Facebook generates wider cascades, whereas WhatsApp produces denser but relatively contained diffusion patterns.

Table 3: Correlation between Verification Behaviour and Forwarding

Variables	R-value	Significance
Verification & forwarding	-0.62	Significant at 1%

Table 3 indicates a strong negative correlation ($r = -0.62$) between verification behaviour and fake news forwarding. The correlation is statistically significant at the 1% level.

This result implies that users who exhibit higher levels of verification tendency—such as cross-checking sources, reading full articles before sharing, or consulting fact-checking websites—are significantly less likely to forward fake news. The negative correlation confirms that critical evaluation acts as a protective factor against misinformation diffusion.

The finding supports behavioural theories suggesting that analytical reasoning and digital literacy reduce susceptibility to misinformation. It also highlights the importance of promoting media literacy interventions to curb fake news proliferation across platforms.

Regression Analysis of Behavioural Predictors
Multiple regression analysis was conducted to examine the predictive power of behavioural variables such as emotional triggers, confirmation bias, perceived credibility, and verification tendency on fake news sharing behaviour. The overall model was statistically significant with an R^2 value of 0.48.

The R² value of 0.48 indicates that 48% of the variance in fake news sharing behaviour can be explained by the selected behavioural predictors. Among these variables, emotional triggers (such as anger, fear, and outrage) and confirmation bias emerged as significant positive predictors. This suggests that individuals are more likely to share misinformation when it aligns with their pre-existing beliefs or evokes strong emotional reactions.

Verification tendency showed a negative beta coefficient, reinforcing its role in reducing forwarding behaviour. Perceived credibility also contributed moderately to the model, indicating that messages received from trusted contacts or familiar groups are more likely to be shared without scrutiny.

Overall Discussion
The combined findings of diffusion speed, network reach, correlation, and regression analysis demonstrate that fake news proliferation is shaped by both platform architecture and human psychology. WhatsApp's encrypted, trust-based environment accelerates rapid forwarding, while Facebook's algorithm-driven public network enables wider audience reach.

Furthermore, behavioural variables significantly influence sharing decisions. Emotional engagement and cognitive bias amplify misinformation, whereas verification practices mitigate its spread. Therefore, combating fake news requires a dual strategy: structural interventions at the platform level and behavioural interventions through digital literacy and critical thinking programs.

The results strongly support the study's hypotheses and confirm that diffusion dynamics differ significantly across Facebook and WhatsApp due to their contrasting technological and social structures.

6. CONCLUSIONS AND IMPLICATIONS
Concluding Remarks
The study confirms that platform architecture significantly influences fake news diffusion patterns. WhatsApp facilitates faster but deeper penetration within private networks, whereas Facebook ensures wider public visibility through algorithmic amplification.

Behavioural factors such as emotional engagement and confirmation bias strongly influence sharing behaviour, whereas verification practices reduce misinformation spread.

Implications
The findings suggest that policymakers and platform regulators must adopt differentiated strategies for open and encrypted platforms. Digital literacy programs should emphasise verification skills and critical thinking among users.

Future Areas of Research
1. Comparative study of misinformation diffusion during election periods.
2. Role of artificial intelligence in detecting fake news on encrypted platforms.
3. Cross-cultural analysis of fake news sharing behaviour.

7. CONCLUSION
In a nutshell, fake news proliferation on social media platforms is not merely a technological issue but a complex interaction between platform architecture and human psychology. Comparative analysis of Facebook and WhatsApp reveals that structural design, network visibility, and behavioral motivations collectively shape diffusion dynamics. Effective intervention requires a multi-dimensional approach integrating regulation, technological solutions, and digital literacy initiatives.

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