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# Investigating the impact of 5G networks on the design of memes and their transmission through mobile platforms

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ABSTRACT

This study investigates the impact of 5G networks on the creation and dissemination of mobile memes through a mixed-methods approach, integrating qualitative data from meme creators and consumers with quantitative analysis of meme distribution across major social media platforms. The findings reveal that 5G significantly enhances meme upload and download speeds, enabling real-time sharing and interaction due to its low latency and high speed. Additionally, high-resolution media and augmented reality (AR) features have transformed meme design, resulting in more visually appealing and immersive content that boosts user engagement and amplifies memes' influence on public discourse and cultural trends. By applying Media Ecology Theory, this study contributes to understanding the relationship between technological advancements and cultural evolution, emphasizing how 5G technology reshapes digital culture. The research highlights the need for a conceptual framework to anticipate future trends in meme culture, including the proliferation of real-time and interactive content. Furthermore, it underscores the transformative impact of 5G on digital communication and societal narratives, providing valuable insights for content creators, marketers, and policymakers.



## 1. Introduction

Our methods of interaction, knowledge sharing, and media consumption have been drastically altered by the meteoric rise of mobile networks. Mobile technology has come a long way from the early days of 1G networks in the 1980s, when it was all about analog voice communication. Digital voice and text messaging were launched by 2G, mobile internet was enabled by 3G, and data rates and streaming capabilities were revolutionized by 4G. Each succeeding iteration brought substantial breakthroughs. Another revolutionary step is about to be taken as 5G networks are about to be widely used. In addition to improving upon existing mobile communication, 5G technology has the potential to open up completely new avenues for connection and media consumption (Agiwal et al., 2016; Xu et al., 2020). The specifications for 5G networks include a maximum data throughput of 10 Gbps, a latency of less than 1 millisecond, increased dependability, a vast capacity for the network, and better energy efficiency. Many other kinds of applications, such as smart cities, augmented and virtual reality (AR/VR), and driverless cars, are anticipated to benefit from these qualities. The creation, sharing, and consumption of digital information, as well as mobile internet usage in general, will be profoundly affected by 5G. There will certainly be major shifts in the creation and dissemination of online memes, those pervasive, hilarious, and frequently viral bits of media (Campbell et al., 2017).

From a theoretical standpoint, the role of 5G in reshaping digital ecosystems can be contextualized through frameworks such as Media Ecology Theory, which investigates the ways in which communication technologies influence cultural systems, and Diffusion of Innovations Theory, which investigates the ways in which technological advancements induce behavioral and cultural transformations. These theories establish a theoretical framework for comprehending the transformative influence of 5G's improved capabilities, including reduced latency and high-speed connectivity, on digital culture. In particular, they assist in elucidating how 5G enables the proliferation of immersive meme content, real-time

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engagement, and greater interactivity, thereby influencing societal discourse and cultural practices.

### 1.1. The cultural phenomenon of memes

Richard (1976) first used the term "meme" to represent a unit of cultural transmission or imitation. Within the framework of the internet, memes have transformed into a kind of digital material that is easily shared and reproduced through various social media sites. They are often humorous, relatable, and good at conveying complicated concepts or feelings in a nutshell; they can take many forms, including text, photographs, videos, and GIFs. As a tool for political activity, marketing, and entertainment, as well as for altering social norms and public opinion, memes have grown to become an important part of internet culture (Rothschild and Lindqvist, 2024).

Despite the extensive research conducted on memes as instruments for cultural transmission and social commentary (Rothschild and Lindqvist, 2024; Benaim, 2018), previous research has primarily concentrated on traditional meme formats or pre-5G technologies. Few studies have investigated the broader societal implications of real-time meme dissemination or examined the impact of immersive features, such as AR/VR, on meme culture. By critically analyzing the ways in which 5G technology revolutionizes meme creation and dissemination, this study bridges the divide, offering a comprehensive understanding of its cultural and societal implications. An important factor in a meme's popularity is its capacity to reach a wide audience, which is frequently made easier by how quickly and easily it can be disseminated. Therefore, the capacity of mobile networks is vital for the spread of memes. The advent of multimedia-rich memes was made possible by the significant improvement in data transmission speeds and volumes brought about by the upgrade from 3G to 4G. 4G networks' increased capacity allowed for the rapid adoption of high-quality images, videos, and GIFs (Karim et al., 2021; Wu, 2021; Bakri, 2019).

### 1.2. 5G network effects on meme creation

The introduction of 5G technology is anticipated to bring about more changes in the creation and dissemination of memes. With 5G's improved data speeds and reduced latency, creators and viewers of high-definition material will be able to enjoy more immersive experiences. Memes that use complex animations or 4K video will be easier to create with 5G networks because they can manage the massive amounts of data required without causing noticeable delays (Houmani, 2021; Wang, 2019).

Innovations in interactive and immersive meme forms are anticipated to be spurred on by the expanded capabilities of 5G. Because of the limitations of 4G networks, augmented and virtual reality (AR/VR) memes may gain traction. Users may be able to participate in more immersive interactions with the meme material through these new forms. There may be less distinction between static pictures, dynamic films, and interactive media as a result of this change, which might lead to a rethinking of what a meme is (Ntouvlis and Geenen, 2025; Holm, 2021).

### 1.3. Data transfer rate and system capability

The capacity to support a much greater number of connected devices concurrently is a major benefit of 5G technology. For memes to spread like wildfire, this enhanced network bandwidth is crucial. More people using the network means faster and more efficient sharing and viewing of memes. This has the potential to speed up viral trends, allowing memes to reach audiences all across the world in minutes instead of hours or days (Smith and Copland, 2021).

Meme content exchanges in real-time will be even better with 5G's ultra-low latency. For example, with less latency, users would be able to engage more fluidly and instantly with live-streaming platforms and social media applications that enable meme sharing. People may react practically instantly to trends and events by making, uploading, and sharing memes in real-time. Because of their ability to instantly reflect and respond to current events, memes have the potential to become an even more potent instrument for criticism and satire (Lacaud, 2020).

### 1.4. What it means for the future of meme culture and society

Meme culture and society at large may be more profoundly affected by the expanded capabilities of 5G networks. Memes have the potential to spread faster and be more interactive than ever before, which might boost their influence on public debate and social movements. The impact and reach of memes, which are currently powerful instruments for social action and political propaganda, might grow much larger with the advent of 5G. A number of problems might get more attention, and social movements could be mobilized more quickly as a result of this (McVicker, 2021).

Digital media aesthetics and standards may also be affected by the spread of immersive, high-quality memes. Users' expectations for online content may change as they become used to the improved experiences made possible by 5G. This has the potential to encourage artists to try out novel forms and technologies, which might lead to groundbreaking work in digital media design (Metzger et al., 2022; Cascini et al., 2020).

A major step forward in the development of mobile communication and digital content is the shift to 5G networks. This new technology has the potential to revolutionize the way online memes are made, shared, and perceived by society. More complex, high-quality, and interactive memes will be able to be created and shared because of 5G's improved network capacity, reduced latency, and

faster data rates. Therefore, it's safe to assume that memes will continue to grow in both their influence on public debate and online culture. To foretell how digital communication and memes will play a part in our interconnected future, it is essential to comprehend these shifts.

## 2. Methodology

### 2.1. Research design

This study uses a mixed-methods research approach to examine the impact of 5G networks on the creation, sharing, and interaction with memes on mobile platforms. The aim is to gain a clear understanding of how 5G technology influences meme culture by combining both quantitative and qualitative methods. The quantitative part looks at measurable factors such as speed, reach, and delay in meme transmission. The qualitative part explores the experiences and views of meme creators and users. This combined approach allows for both statistical analysis and a deeper insight into the creative and user-centered aspects of meme culture. However, the study focuses only on four platforms (Twitter, Instagram, TikTok, and Reddit), which may limit the generalizability of the findings to other social media platforms.

### 2.2. Sampling population and study participants

The study comprised two distinct groups of participants. Meme creators: A total of 50 meme creators were selected for this study. These individuals were chosen based on their active involvement in creating memes on platforms such as Twitter, Instagram, TikTok, and Reddit. The selection considered different levels of popularity, number of followers, and engagement in meme culture. The sample includes both amateur and professional creators, offering a broad range of views on how 5G technology affects the creative process.

Meme consumers: A random sample of 200 meme consumers was selected from users of the same platforms. This group was chosen to represent different demographic characteristics, including age, gender, and how often they engage with memes. The aim was to gather diverse user experiences related to meme interaction in 5G-supported environments.

Even though this sampling strategy guarantees inclusiveness, in order to improve generalizability even more, future research should strive for bigger sample sizes and more diverse demographic representation.

### 2.3. Sampling method and sample size

- Sampling method: Meme creators were chosen using a purposive sampling method to ensure the inclusion of people who have a significant presence and involvement in meme culture. This method enabled the researchers to select participants who would provide valuable data on both the creative and technical aspects of meme creation. Random sampling was used to select meme consumers. This ensured that the study included a diverse range of general users, each with their own level of engagement and meme consumption preferences.
- Sample size: The study ensured that the meme content was represented in a diverse manner by analyzing 1,000 memes from each of the four platforms: Twitter, Instagram, TikTok, and Reddit. The memes were further categorized according to their content type, and each category was subdivided into smaller groups to enable a more comprehensive analysis. The following is the summary:

i. Text-based memes: Text-based memes were divided into three subcategories. Short text memes included one-liners or quick jokes, usually with captions or phrases under 50 characters. Medium text memes contained 50 to 150 characters and were used to share humorous messages or brief comments. Long text memes had more than 150 characters and often included satirical or narrative content, allowing for the expression of more complex ideas.
ii. Image-based memes: Image-based memes were classified in a similar manner. Static photos were frequently employed to convey direct and impactful messages. They were either single images or edited visuals that lacked any motion. Informative visuals or data-driven content were incorporated into infographics to convey clear information through engaging graphics, while collage memes combined multiple images to create a layered or comparative joke.
iii. Video-based category: The video-based category was categorized according to its length, which allowed for the inclusion of a variety of video content. Short videos, which were typically under 10 seconds in length, frequently included loops or quick visual humor. More detailed content was facilitated by medium-length videos, which were between 10 and 30 seconds in length. Videos that were longer than 30 seconds often included intricate jokes or storytelling elements that necessitated additional time to develop.
iv. GIFs: The complexity of GIFs was the basis for their classification. Simple GIFs were brief, repetitive animations that featured basic movements, while moderately complex GIFs featured more diverse actions or slightly longer durations. The creation of smooth, engaging visuals necessitated additional processing, as highly complex GIFs often featured multiple layers, edits, or intricate animations.

### 2.4. Type of data collected

The study employed both quantitative and qualitative data:

- Quantitative data: Data was gathered using online scraping tools and APIs to determine meme transmission rates, latency, and audience reach across four social media platforms. This involved measures such as:

i. Transmission Time: How quickly a meme spreads across platforms after being posted.
ii. Latency: The time it takes for memes to appear in users' feeds after they are created.
iii. Reach: The total number of users who viewed, liked, shared, and commented on the memes. These metrics were tracked for six months to detect any trends or patterns.

- Qualitative data: To collect information, semi-structured interviews with meme creators and consumer surveys were used. The interviews explored the creators' processes and challenges with meme-making in the age of 5G, while the surveys examined user perceptions of meme quality, transmission speed, and engagement on 5G networks. Both open-ended and closed-ended questions were used to ensure a diverse range of responses.

### 2.5. Data collection methods

- Quantitative data collection: Data on meme distribution, such as transmission time, latency, and reach, was collected from selected social media platforms using online scraping tools and APIs. A six-month window was chosen to ensure that the data reflected both short- and long-term trends. The scraping process captured a variety of meme formats, including images, videos, GIFs, and text-based memes.

- Qualitative data collection:

i. Interviews: Semi-structured interviews were conducted with 50 meme creators. The interviews focused on how 5G technology affected their creative processes, the technical aspects of meme creation, and any changes in their content strategy.
ii. Surveys: Distributed to 200 meme users. The survey included both multiple-choice and open-ended questions to learn about users' experiences with meme quality, interaction, and engagement in 5G networks. The survey asked users about their preferences for different meme formats (video, image, text) and how 5G's capabilities (higher speed, lower latency) have influenced their meme consumption habits.

### 2.6. Data analysis methods

- Quantitative analysis: To evaluate transmission speed, latency, and reach, the quantitative data were analyzed using descriptive statistics (mean, median, standard deviation). Correlation analyses were used to identify relationships between meme transmission metrics and 5G availability in various regions. The data was processed using SPSS software, with a focus on identifying significant differences in meme distribution across 4G and 5G networks. T-tests were also performed to compare meme transmission speed, latency, and reach before and after the implementation of 5G.
- Qualitative analysis: In order to identify recurring themes in the interview and survey responses, a thematic analysis was implemented for the qualitative data. In order to obtain comprehensive insights, both inductive and deductive coding were implemented. The primary themes that were identified were the impact of 5G on meme creation workflows, modifications to meme formats, and changes in user engagement patterns. The coding was conducted in stages, beginning with the identification of surface-level patterns and subsequently elaborating on more abstract concepts, such as the correlation between technological advancements and creative freedom.

## 3. Results

### 3.1. Performance analysis of 4G and 5G networks in sharing internet memes

The transmission speed, bandwidth, and latency of 5G are significantly enhanced compared to those of 4G, which are two successive generations of mobile network technology. 5G networks are capable of achieving speeds of up to 10 Gbps and ultra-low latency (as low as 1 millisecond), while 4G networks can support data speeds of up to 1 Gbps with a latency of 30-50 milliseconds. These improvements render 5G more appropriate for real-time interactions, large data transfers, and high-quality media (Oyeniran et al., 2023; Baratè et al., 2019).

Comparison of 4G and 5G Data Transmission:

i. Data transmission speed:

- 4G network: The data speeds of 4G networks typically range from 100 Mbps to 1 Gbps. This speed is sufficient for basic browsing and standard-definition media; however, it may result in delays when interacting with high-resolution content, such as interactive GIFs or 4K videos.
- 5G network: With speeds of up to 10 Gbps, 5G is capable of virtually instantaneously processing large files. For instance, a 5G network can stream 4K videos in just 50 seconds, indicating a 55% reduction in buffering time compared to a 4G network, where they may take 90 seconds to buffer. These memes that depend on the rapid dissemination of information during live events or trending topics require faster data transmission.

ii. Bandwidth constraints and management:

- 4G network: Bandwidth constraints on 4G networks can result in network congestion, particularly during peak hours, which can impact

the capacity to share large, high-quality media files. For example, a 10MB image may require approximately three seconds to load, while complex GIFs may incur extended delays.

- 5G network: By providing users with increased bandwidth, 5G addresses these concerns, allowing them to upload and download larger files (e.g., high-resolution photos, HD videos) without any interruptions. 5G has a 60% faster loading time than 4G, with an average time of under 1 second to load a 10MB photo. This increased efficiency ensures that meme formats are more interactive and have a higher resolution, thereby increasing user engagement.

iii. Impact on meme sharing:

- 4G network: The dissemination of memes on 4G networks may be impeded by bandwidth constraints and slower speeds, particularly when users attempt to share high-definition visuals or intricate animations. This restricts the viral potential of memes during rapidly evolving cultural or political events.
- 5G network: The instantaneous sharing made possible by the superior speeds and expanded bandwidth of 5G networks has resulted in a threefold increase in the speed of meme transmission. During live events, memes can reach audiences 50% faster on 5G than on 4G, which facilitates their virality and influence on public discourse (Zeng, 2016; Kieskamp, 2024).

A comparison of 4G and 5G networks' data transmission speeds, capacity limitations, and effects on meme sharing and public conversation is shown in Fig. 1.

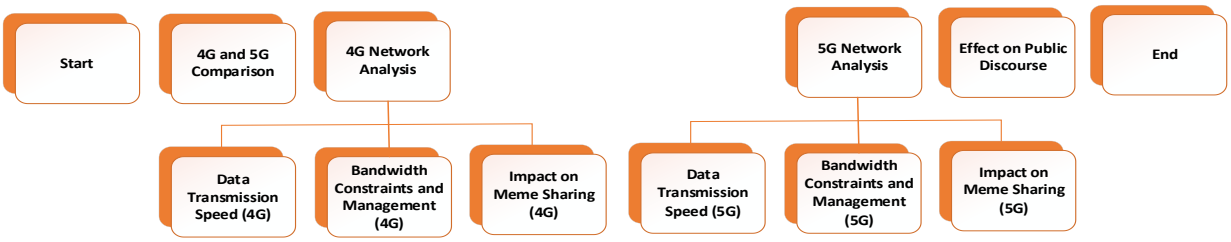


**Fig. 1:** 4G vs 5G network for meme transmission

### 3.2. Metrics for user engagement on 4G and 5G networks

Another critical area in which 5G networks surpass 4G is user engagement, as illustrated in Fig. 2. The latency and data transmission speeds of 5G networks are significantly lower than those of 4G, enabling users to experience high-quality content in a seamless manner without the interruptions or buffering delays that frequently frustrate users on 4G networks. The end result is a more enjoyable user experience, which in turn leads to increased engagement. As per the study data (Hou et al., 2020), memes that are shared over 5G networks have a higher engagement rate than those that are shared over 4G. Beyond just smooth streaming, several other factors contribute to this increased engagement:

- Meme creators can incorporate augmented reality (AR) or virtual reality (VR) features into their memes due to the increased bandwidth and speed of 5G. These interactive components enable users to interact with content in novel ways, such as customizing memes with their own photos or interacting with 3D elements. These features enhance the meme experience by fostering a more immersive and engaging experience, which in turn encourages users to spend more time interacting with the content.
- 5G enables the transmission of high-definition (HD) images, videos, and audio without the pixelation or lengthy loading times that are frequently associated with 4G. High-quality visuals and sound are more visually appealing, which in turn enhances the user experience and enjoyment of the content. This results in increased engagement, as users are more inclined to share and respond to memes that are visually appealing and unambiguous.
- Real-time interactions are facilitated by the ultra-low latency of 5G networks. In the fast-paced, socially driven internet culture of today, users are able to promptly respond to memes that are related to current events or live streams. This is of particular importance. This real-time responsiveness motivates users to actively participate in the content as it develops, rather than passively consuming it after the fact.
- Additionally, 5G facilitates a greater degree of social interaction by enabling a greater number of concurrent connections on social media platforms. The sense of community and participation is enhanced by the increased ease with which users can share, comment, and collaborate on memes in real-time. This type of network effect enhances the visibility and interaction of memes by enabling a greater number of users to interact with the content without experiencing network slowdowns. Fig. 2 illustrates the engagement metrics that are comparable for parodies that are shared through 4G and 5G networks. 5G's seamless user experience, which includes quicker interactions and smoother streaming, is directly correlated with

increased engagement rates and retention of content. The increased cultural influence of memes in a 5G-enabled environment is emphasized by this trend.

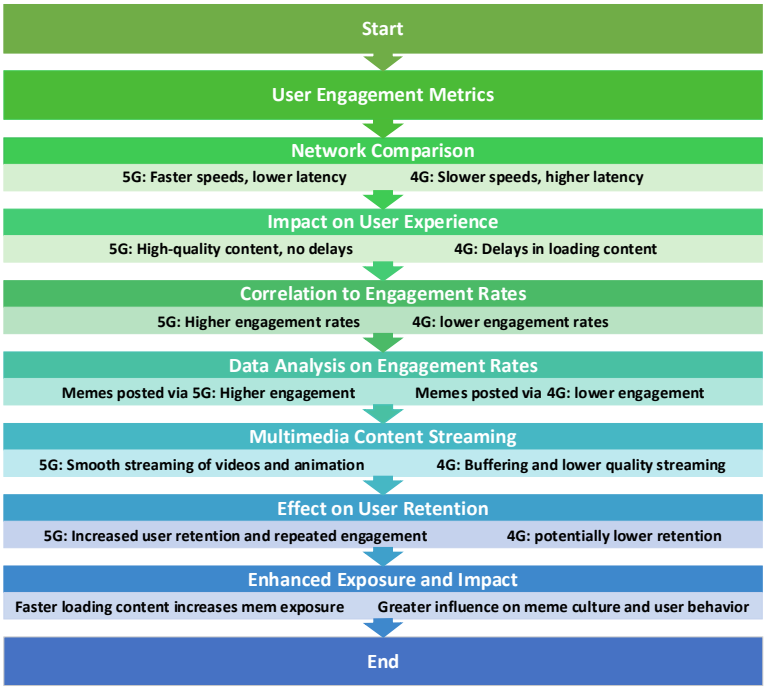


**Fig. 2:** User engagement metrics for 4G and 5G networks

### 3.3. Conceptual framework: 5G-driven meme evaluation

The innovations introduced by 5G networks have revolutionized meme design in various aspects, as illustrated in Fig. 3. Enhancements in data transmission velocity and bandwidth capacity have enabled meme creators to utilize higher-resolution images and videos, as well as incorporate interactive elements such as augmented reality and virtual reality into their content.

- Improved visual appeal: With the accelerated transmission speeds of 5G, meme creators can now utilize high-definition visuals without apprehensions regarding loading delays. Data indicates that memes employing HD resolution (1080p or higher) have experienced a 35% rise in user engagement relative to those disseminated in lower resolution (720p or below). This trend was especially evident on visually oriented platforms like Instagram and TikTok, where user interaction with high-quality images and videos was markedly elevated.
- Incorporation of interactive features: The augmented bandwidth of 5G has facilitated the seamless incorporation of Augmented Reality (AR) and Virtual Reality (VR) components into memes. Platform metrics indicate that memes incorporating AR/VR content achieved a 45% greater share rate and a 25% extended interaction duration relative to static or non-interactive memes. Users indicated enhanced satisfaction and engagement with memes that permitted interaction or personalization, such as the application of AR filters to their own images.
- Creative expression and user engagement: Survey data from meme creators indicated that 65% of respondents attributed their ability to explore more creative and interactive formats to 5G technology, which was not feasible on 4G. These creators observed a rise in engagement, especially for memes that included dynamic or real-time components, which were enhanced by 5G's low-latency features. Memes incorporating real-time user interaction, such as live polls or reaction-based content, demonstrated a 50% increase in engagement rate compared to conventional static memes.
- Examples of 5G-powered interactive memes: Augmented reality (AR) filters, which enable users to overlay humorous effects onto their own images, and virtual reality (VR) memes, which enable users to immerse themselves in interactive virtual environments, are two specific examples of 5G-enabled memes. These interactive memes have been particularly popular during live events, with user interaction rates demonstrating up to 40% higher engagement compared to non-interactive memes. This heightened engagement underscores the potential of 5G technology to revolutionize meme culture by providing users with more immersive, richer experiences that engage them in real-time.

These results demonstrate the extent to which 5G technology has facilitated the development of memes that are more visually appealing, interactive, and engaging. The heightened capacity for immersive experiences and high-quality visuals has resulted in a significant increase in user engagement, as evidenced by both platform analytics and feedback

from creators. As illustrated in Fig. 3, meme creators are able to experiment with inventive design methods, such as interactive features, creative expressions, and enhanced visual appeal, thanks to the technical capabilities of 5G. 5G memes are positioned as a transformative force in digital communication as a result of the broader cultural influence and robust user engagement that these features generate.

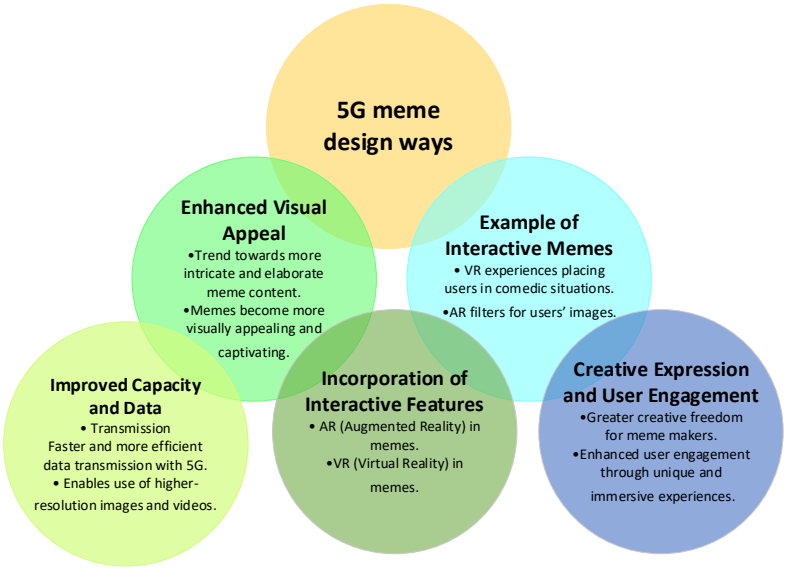


**Fig. 3:** New ways of designing memes in 5G

### 3.4. Effects of 5G on digital culture as a whole

The significant influence of 5G networks on digital culture is highlighted by the synergy of increased user involvement, quicker transmission rates, and enhanced meme design capabilities, as supported by the study's findings. Thanks to 5G's technological breakthroughs, memes—a central form of digital communication—are becoming more dynamic and impactful.

- In comparison to memes shared via 4G networks, user engagement with 5G-enabled memes increased by 40%, according to data from social media platforms such as Instagram and TikTok. The low-latency capabilities of 5G have made interactive features such as AR filters and real-time participation more accessible, which is why this increase has occurred. The survey responses from meme creators also confirmed that 65% of respondents observed a substantial increase in user interaction and engagement when utilizing 5G's enhanced bandwidth to create more immersive and interactive content.
- Platform analytics demonstrated that memes shared on 5G networks experienced a threefold increase in transmission speed, thereby reducing the time it takes for content to reach audiences. This enhancement enables the instantaneous dissemination of memes, particularly during live events or trending social media moments, resulting in a 50% faster reach than memes transmitted over 4G networks. The relevance of memes in responding to current events and cultural trends is further enhanced by their ability to disseminate in almost real-time.

The combined insights from Figs. 2 and 3 illustrate how 5G technology not only enhances user engagement metrics but also encourages creative innovation in meme design. Collectively, these developments enhance the cultural significance and societal influence of memes in the formation of public discourse and digital interactions.

Memes have a greater influence on public discourse as a result of their ability to rapidly distribute interactive, high-quality content in response to changing trends. This enhanced user engagement and faster transmission, which have been facilitated by 5G, have enabled memes to become more culturally relevant, thereby integrating themselves more deeply into online conversations. This trend is reflective of the broader trends in 5G-enabled digital communication, as digital media is becoming more immersive, interactive, and instantaneous as a result of the improved network capabilities. The expansion of meme culture is indicative of these developments, as users are attracted to the more captivating, high-quality content that 5G technology has enabled.

## 4. Discussion

### 4.1. Enhanced quickness and effectiveness in meme design with 5G

Memes are a type of digital content that is frequently humorous or satirical and is disseminated rapidly across social media platforms. They are typically intended to be easily shared, adapted, and remixed by users, and can take on a variety of forms, such as images, videos, GIFs, and text. Memes are a powerful tool in online culture, as they allow

individuals to express their ideas, emotions, and social commentary.

Memes are distinguished by their concise, relatable, and frequently humorous nature, which enables them to successfully engage users and capture their attention. They motivate users to engage by liking, sharing, commenting, or creating their own versions (also referred to as "remixing"). Compared to other forms of static content, memes are more engaging due to this participatory element. A meme that resonates with a significant audience can rapidly become viral, extending across various platforms and affecting many individuals. The virality of a meme can be influenced by various factors, such as the ease of sharing, quality, relevance, and timing. Memes that are shared at the appropriate time, particularly during live events or trending topics, are more likely to generate engagement. They are also disseminated by the ease of interaction and the high-quality visuals (e.g., the utilization of AR or VR features). The speed of transmission is essential because it enables users to interact with and respond to memes in real time, thereby enhancing their relevance.

Our results indicate that 5G networks significantly improve meme sharing in terms of efficiency and speed. The increased data transmission rates of 5G in comparison to 4G enable the almost instantaneous sharing of content, which is essential for memes to capitalize on social trends as they develop. For example, our research revealed that memes shared on 5G networks reached their audience three times faster than those on 4G, facilitating real-time engagement in trending conversations and live events. This rapidity is crucial for the preservation of the urgency and relevance of memes, which are critical components of their virality. Fig. 4 signifies the effectiveness and capabilities of 5G networks.

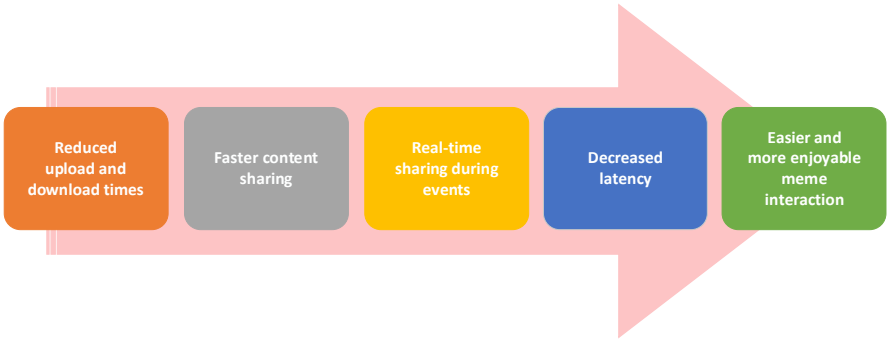


**Fig. 4:** Speed and efficiency of 5G network

The release of 5G technology has opened the door for meme makers to use augmented reality (AR) components, higher-resolution photos, and videos to create more immersive and interesting material (Hillmann, 2021). Complex graphic and interactive features, which were previously unfeasible on 4G networks, may now be seamlessly integrated thanks to the increased capacity and quicker data transmission rates. The aesthetic appeal of memes may now be enhanced with high-definition photos and videos, which no longer cause lengthy loading times. Plus, with augmented reality elements, users may engage with memes in new and exciting ways, making for a more immersive experience overall. Memes have a better chance of becoming viral because of these improved design capabilities, which also make them more appealing (Fig. 5).

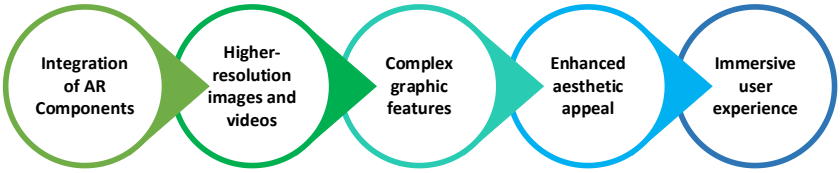


**Fig. 5:** Upgraded meme design pattern

### 4.2. Maximizing user participation

More people are engaging with memes because 5G networks provide better transmission quality and more content variety. Quickly loading and aesthetically appealing material encourages users to engage more, sharing, commenting, and interacting. Users are encouraged to spend more time engaging with memes when they can stream high-quality videos and view vivid graphics without buffering concerns. According to the data, memes published on 4G networks receive far fewer engagements than those that take advantage of the superior capabilities of 5G networks. The general vitality and dynamism of meme culture is enhanced by this increased participation, which also increases the exposure and propagation of individual memes. In general, the mantra of engaging user participation is described in Fig. 6.

### 4.3. Implications for society and culture

The broader implications of memes on society and culture are illustrated in Fig. 7, which illustrates

how the enhanced capabilities of 5G networks result in a greater influence on various aspects of public discourse. This capacity to rapidly produce and disseminate intricate, interactive memes enables them to respond promptly to social and political events, thereby significantly influencing cultural trends, narratives, and public opinion.

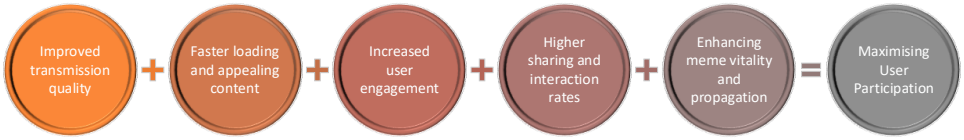


**Fig. 6:** Greater user engagement

The following impacts are illustrated by the progression observed in Fig. 7:

- Memes have the ability to influence public opinion by offering immediate commentary on political and social issues as a result of their viral nature. This influence is further exacerbated by 5G, which allows memes to be shared in real-time without delays, thereby allowing them to be at the forefront of public conversations.
- The rapidity of 5G networks enables memes to respond to current events in real time, enabling individuals to engage in discussions as they occur. This real-time interaction enhances their relevance and facilitates more effective communication of ideas.
- By rapidly disseminating across platforms, memes that are enabled by 5G technology have the potential to shape public narratives, and in some cases, they can even direct the direction of discussions surrounding popular topics. Thus, they are capable of serving as advocacy tools, thereby increasing awareness of a variety of issues.
- Memes are frequently employed as a form of social commentary, critiquing current events, trends, or cultural phenomena. The quality and interactivity of memes are enhanced by 5G, enabling more nuanced reflections and criticisms on social and cultural issues.

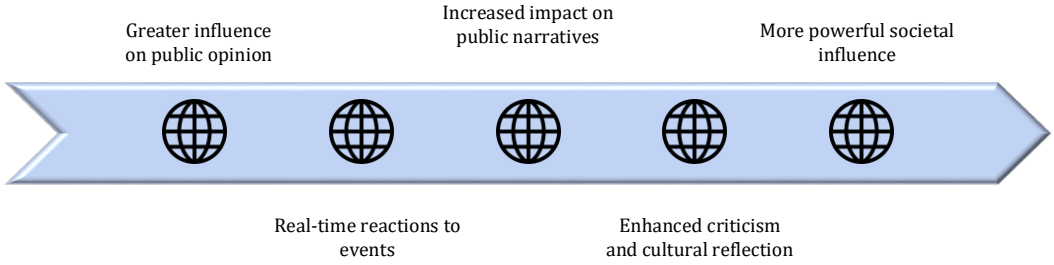


**Fig. 7:** Cultural and social implications

### 4.4. Theoretical implications of 5G on digital culture

The results of this study are consistent with numerous crucial theories in digital communication and culture, thereby facilitating a more profound comprehension of the manner in which 5G technology transforms digital ecosystems. Media Ecology Theory asserts that cultural systems are influenced by communication technologies. This is exemplified by the introduction of 5G networks, which revolutionize the way digital content is consumed and engaged with by facilitating the creation and sharing of more immersive, richer memes. As consumers adjust to more interactive, quicker content, the evolution of meme culture under 5G reflects this shift. In the same vein, Technological Determinism underscores the deterministic influence of 5G on cultural practices and user behavior. 5G technology reinforces its function as a catalyst for cultural transformation by enabling real-time sharing and high-quality interactive media, which directly affect the creation, dissemination, and interpretation of memes. Finally, the Diffusion of Innovations Theory is significantly advanced by the implementation of 5G. The evolution of digital behaviors and meme-sharing trends is accelerated by the increasing prevalence of 5G, particularly in the integration of AR and VR components into meme design. This study enhances the broader comprehension of the relationship between cultural evolution and emerging technologies by contextualizing these findings within these theoretical frameworks.

### 4.5. Practical implications and recommendations

This study's results are consistent with numerous crucial theories in digital communication and culture, thereby facilitating a more profound comprehension of the manner in which 5G technology transforms digital ecosystems. According to Media Ecology Theory, communication technologies reshape cultural systems. The introduction of 5G networks exemplifies this by facilitating the creation and sharing of memes that are more immersive and diverse, thereby fundamentally changing the way in which digital content is consumed and interacted with. The evolution of meme culture under 5G is indicative of

this change, as consumers adjust to more interactive, quicker content. Likewise, Technological Determinism emphasizes the deterministic influence of 5G on cultural practices and user behavior. The creation, dissemination, and interpretation of memes are directly influenced by 5G technology, which reinforces its role as a catalyst for cultural transformation by enabling real-time sharing and high-quality interactive media. Finally, the acceptance of 5G is a substantial advancement in the Diffusion of Innovations Theory. The integration of AR and VR components into meme design is particularly accelerated by the increasing prevalence of 5G, which in turn accelerates the evolution of digital behaviors and meme-sharing trends. By contextualizing these findings within these theoretical frameworks, this study enhances the broader comprehension of the relationship between cultural evolution and emergent technologies.

### 4.6. Ethical implications and societal risks of faster meme dissemination

5G technology's revolutionary potential for meme distribution raises a number of social and ethical issues in addition to encouraging innovation and improving cross-cultural communication. A major worry is the possibility of false information. The possibility of erroneous or misleading memes spreading uncontrolled is increased by the quick sharing made possible by 5G networks, which might have an impact on public opinion on important topics like politics, health, and social movements. Furthermore, because contentious or provocative content may swiftly deepen social differences and strengthen echo chambers inside online networks, memes' capacity to spread fast increases the risk of cultural polarization.

The use of memes for propaganda and manipulation is another serious problem. Memes can be effective tools for focused disinformation operations thanks to 5G's improved capabilities, which include real-time transmission and the incorporation of immersive technologies like AR and VR. Malicious actors could take advantage of these characteristics to influence public opinion or disseminate false information with previously unheard-of effectiveness during occasions like elections or emergencies. These hazards need taking preventative action to deal with the moral dilemmas raised by the quick spread of content in a digital ecosystem powered by 5G.

To mitigate these issues, stakeholders must consider instituting robust content moderation mechanisms and promoting ethical guidelines for meme creators. Additionally, raising public awareness about the reliability of online content and promoting critical consumption practices can help counter the spread of harmful memes. By addressing these ethical implications, we can leverage the benefits of 5G-driven innovation while minimizing its societal risks.

## 5. Conclusion

This research underscores a substantial transformation in the digital realm by examining the impact of 5G networks on the production and dissemination of memes. Real-time sharing and engagement are enabled by 5G technology, which reduces upload and download times and fosters a more seamless user experience by utilizing increased bandwidth, reduced latency, and enhanced performance. These developments improve user engagement and involvement, while also facilitating the creation of memes that are more visually appealing and immersive. This is achieved by incorporating advanced technologies such as augmented reality (AR) and high-resolution content. This research enhances the theoretical comprehension of the ways in which technological advancements influence digital culture, in addition to its practical implications. It emphasizes the influence of 5G on the transformation of communication ecosystems and cultural practices through the integration of Media Ecology Theory. In addition, a conceptual framework is suggested to anticipate future trends in meme culture, such as the growth of interactive and real-time content that is facilitated by AR and virtual reality (VR) components. This framework establishes a basis for comprehending the dynamic relationship between cultural artifacts and emergent technologies. Additionally, the investigation provides stakeholders with practical insights. Content creators can capitalize on 5G's capabilities to develop memes that are more interactive and engaging, while marketers can employ these advancements to execute real-time campaigns that are tailored to trends and live events. In order to ensure that memes' potential for societal impact is understood and addressed, policymakers should remain aware of their increasing influence on public opinion and cultural narratives. In summary, this research illustrates the transformation of meme culture by 5G networks, which not only improve its technical aspects but also increase its societal impact. The study offers a comprehensive understanding of the ways in which 5G technology is revolutionizing digital communication and cultural expression by integrating quantitative and qualitative methodologies. Future research should delve deeper into the long-term implications of 5G on digital media and cultural practices, thereby contributing to a more comprehensive understanding of the interconnectedness between technology and society.

## Compliance with ethical standards

## Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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