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Research Article

User Engagement Patterns in Viral Social Media Content: A Multinational Comparative Study Based on Interaction Ratios and Data Visualization

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ABSTRACT

This study explores user engagement patterns in viral social media content through a data visualization dashboard built with Power BI. The dataset comprises 5,000 viral posts across eight countries and four major platforms—Instagram, TikTok, X (Twitter), and YouTube, encompassing ten content hashtags. The analysis covers over 13 billion total views, with an average of 2.56 million views per post and an overall engagement rate of 22.27%. By visualizing metrics such as likes, comments, shares, and views, the dashboard enables multi-dimensional filtering and correlation analysis. The strongest finding is a perfect correlation (CC = 1.00) between views and all engagement types when filtered by content type, highlighting the pivotal role of format (e.g., YouTube Shorts, Photo posts) in driving interactions. High correlations were also found regionally, such as views and comments (CC = 0.92), and views and shares (CC = 0.91), suggesting significant influence of geographic and cultural factors.Further insights show that YouTube leads with 76.29% of total engagements in Brazil, while TikTok and Instagram dominate in the USA. Hashtags also contribute meaningfully, with view-comment correlation reaching 0.88. This dashboard proves valuable not only for tracking metrics but for generating actionable insights to inform content strategy, platform prioritization, and regional targeting. The findings affirm that virality is not incidental but influenced by measurable factors, making data-driven decisions essential for digital success.

Keywords: viral content; user engagement; interaction rate; data visualization; Power BI

1. INTRODUCTION

The phenomenon of viral content on social media has garnered significant attention in recent research due to its impact on information dissemination, public opinion formation, and social behavior. User engagement patterns play a crucial role in understanding how content spreads and influences audiences, particularly in multinational contexts where digital cultures and platform preferences vary (Pew Research Center, 2021; Digital News Report, 2023).

Social media engagement is not universal. Platform preferences and user interaction styles differ substantially across countries, shaped by distinct cultural and social dynamics. For example, platforms such as Instagram or Pinterest are more dominant in certain regions, indicating that engagement patterns are deeply contextual (Pew Research Center, 2021). Moreover, algorithmic recommendations influence the distribution of viral content. Content with high emotional appeal tends to be prioritized, often driven by a small but highly active group of users (Knight, 2023).

In light of these complexities, interaction ratios have emerged as a key metric for evaluating the effectiveness of content dissemination based on the quantity and intensity of user responses. At the same time, data visualization plays a pivotal role in presenting these complex interaction patterns, allowing for clearer cross-national trend comparisons, particularly in the context of global issues such as conflict or economic crises (Digital News Report, 2023).

Furthermore, understanding engagement patterns is essential for designing interventions to combat misinformation. By analyzing interaction ratios and the spread of false content across countries, policymakers can develop more targeted and culturally contextualized strategies (Review on Disinformation, 2023).

Therefore, this study aims to analyze user engagement patterns in viral social media content through a multinational comparative approach, using interaction ratios and data visualization. This research seeks to provide deeper insights into the dynamics of digital content virality shaped by cultural, algorithmic, and social factors across diverse national settings.

2. LITERATURE REVIEW

2.1 Social Media and Virality

The influence of social media virality on public perception and behavior has become a central focus in contemporary research. Viral content, particularly in areas such as health and social issues, has demonstrated measurable impacts on audience attitudes and behaviors (Viral Vaping, 2023; Impact of COVID-19 Vaccine Misinformation, 2022). For instance, the spread of e-cigarette-related content on social media has been linked to shifts in youth attitudes toward tobacco use, underlining the platform's power in shaping health behavior (Viral Vaping, 2023).

Virality metrics such as likes, shares, and comments do more than signal popularity, they interact with message framing to influence users' perception of persuasive intent, often shaping behavioral intentions (The Interplay between Social Media Virality Metrics and Message, 2023). These effects can be amplified or moderated by cultural values; users are more responsive to viral content when it challenges their cultural expectations (Cultural Values Influence What Goes Viral, 2021).

Source credibility is also a key determinant in content virality. The perceived trustworthiness of a news outlet significantly influences user engagement and the sustained diffusion of information, independent of follower count (Followers Do Not Dictate the Virality of News Outlets, 2024). This finding reinforces the critical role of source reliability in the viral dissemination process. Virality's influence is especially concerning in the context of health misinformation. During the COVID-19 pandemic, the rapid spread of vaccine-related misinformation on social platforms significantly contributed to public vaccine hesitancy, demonstrating the real-world consequences of viral disinformation (Impact of COVID-19 Vaccine Misinformation, 2022). Additionally, highly viral posts, particularly on platforms like Twitter, have been shown to influence user behavior and perception (The Significance of a Viral Post, 2021).

From a strategic communication standpoint, understanding what makes content "go viral" is essential. Social network dynamics and the design of shareable messages are instrumental in extending reach and boosting engagement (Viral Marketing and How to Craft Contagious Content, 2020). Moreover, virality has evolved into a broader communication paradigm that reflects how digital content shapes ideological narratives and public discourse (Virality as a Paradigm of Digital Communication, 2020).

In sum, social media virality exerts substantial influence across domains by mediating how content is perceived, trusted, and acted upon. Its mechanisms, rooted in message design, platform algorithms, cultural dynamics, and source credibility, highlight the need for further empirical examination in varied national and cultural contexts (Viral Vaping, 2023; The Interplay between Social Media Virality Metrics and Message, 2023; Followers Do Not Dictate the Virality of News Outlets, 2024; Impact of COVID-19 Vaccine Misinformation, 2022; The Significance of a Viral Post, 2021; Viral Marketing and How to Craft Contagious Content, 2020).

2.2 User Engagement

Existing literature on user engagement across social media platforms reveals its broad impact on diverse sectors such as marketing, tourism, health communication, and social commerce. During the early stages of the COVID-19 pandemic, social media influencers (SMIs) held significant yet underutilized potential in health communication, highlighting their social capital and potential to amplify public health messaging (Archer et al., 2020).

In the realm of consumer behavior, engagement with non-sponsored brand-related user-generated content (UGC) on platforms like Instagram is largely driven by the perceived value and relevance of the content, which influences brand attitudes (Davcik et al., 2021). Likewise, active engagement with brand content, especially in service-based sectors such as ride-hailing, has been shown to enhance brand trust and customer commitment (Prayitno et al., 2021).

UGC also plays a pivotal role in the tourism sector. Engagement with shared travel experiences can strengthen visitor loyalty at cultural heritage sites (Xu et al., 2021). Similarly, social media marketing enhances brand image in tourism, with follower engagement on platforms like Instagram serving as a key influence (Damayanti et al., 2021).

In social commerce, interpersonal interactions are essential to strengthening customer relationship management (CRM). Engagement during the pandemic positively influenced trust and commitment in consumer relationships (Hossain et al., 2021). Supporting this, Busalim et al. (2021) identify social interactions and platform usability as core drivers of engagement behavior in social commerce environments.

Resident engagement on social media has also been explored through statistical and text-mining methods, showing fluctuating sentiment and participation patterns over time, an important consideration for optimizing engagement strategies (Jiang et al., 2021). Kheen et al. (2021) further propose a conceptual framework suggesting that user engagement in mobile social commerce directly influences purchase decisions, emphasizing the need for contextual and cultural validation.

Collectively, these studies affirm that user engagement significantly shapes brand perception, trust, loyalty, and behavior across various digital contexts. Mechanisms such as content interaction, peer influence, and influencer collaboration emerge as powerful tools for fostering meaningful user relationships and behavioral change.

2.3 Multinasional Comparative in Social Media

Multinational comparative analysis in social media research provides essential insights into how communication and marketing strategies vary across regions and markets. Antoniades et al. (2020) highlight this by examining influencer engagement in Latvia and Cyprus, demonstrating social media's effectiveness as an advertising tool within diverse national contexts. Their findings underscore the necessity of understanding regional dynamics in influencer marketing. Similarly, Zhukov et al. (2020) investigate the international marketing practices of transnational corporations (TNCs) through the lens of globalization and regionalization. Their use of graphical, tabular, and systematic comparison methods reveals how multinational strategies are shaped by regional interdependencies, illustrating the value of comparative frameworks in capturing global marketing trends.

Han (2021) extends this approach by analyzing local broadcasters' Twitter usage across different market environments. The study shows how regional conditions influence social media strategies, offering a nuanced understanding of platform deployment and audience engagement in localized settings. Arslandere (2021) applies comparative analysis to luxury brand communications, focusing on how brands utilize social networks and websites across borders. The research highlights the diversity of digital communication strategies and emphasizes the importance of accounting for regional and cultural specificities in international marketing.

Further strengthening this perspective, Wau (2025) highlights how financial technology use among young consumers varies significantly based on local trust and convenience levels, underscoring regional economic behaviors in digital contexts. Hasibuan (2025) also shows how the use of digital tools in education differs across Indonesian regions, pointing to localized technological adoption strategies. Additionally, Fauzi (2025) demonstrate that social media interventions to curb harmful digital behavior, like online gambling, require tailored approaches that reflect specific community conditions.

Taken together, these studies affirm that multinational comparative analysis is a vital methodological approach in social media research. It enables a deeper understanding of regional differences, informs strategic adaptations, and enhances the global applicability of social media practices. By examining diverse national contexts, researchers and practitioners can better address the challenges and opportunities inherent in cross-border digital communication.

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2.4 Data Visualization in Social Media Analytics

The integration of data visualization in social media analytics has become essential for deriving actionable insights from complex and large-scale datasets. Visual tools enable a deeper understanding of consumer behavior, organizational responses, and strategic decision-making across various domains.

Radi et al. (2021) utilized content, descriptive, and sentiment analysis to examine consumer perceptions of sustainability in the mobile phone industry. These methods, inherently dependent on data visualization, facilitated the identification of features aligning with the triple bottom line (TBL), thereby improving comprehension of sustainability-related attitudes.

Ali et al. (2021) emphasizes the role of big data analytics, including social media data, in promoting sustainable business practices and stakeholder collaboration. While not explicitly detailed, visual analytics are implied as integral in synthesizing insights across organizational and marketing domains within participatory web environments. Similarly, Soni et al. (2021) conducted a bibliometric analysis on social business research, where visualization tools were crucial in mapping scholarly developments and future research trajectories.

In the realm of crisis management, Park (2021) illustrates the use of big data from news and social media sources in developing COVID-19 strategies. Though not directly stated, visualizations are critical for tracking crisis trends and responses. Wang et al. (2021) also examine corporate crisis communication through electronic word-of-mouth (e-WoM) and trust recovery, with data visualization aiding in the interpretation of shifting consumer sentiment and trust dynamics.

Zhang et al. (2022) further underscore the significance of social media analytics capability (SMAC) in enhancing organizational agility, particularly in the tourism sector. Their framework suggests that visual representation of analytics supports the link between agility and performance, reinforcing the role of visualization in strategic planning and adaptability.

Collectively, these studies demonstrate that data visualization is a foundational component of social media analytics. It transforms raw data into digestible insights, facilitating trend monitoring, strategic planning, and crisis response. As such, visualization tools not only enhance interpretability but also empower stakeholders to make informed, data-driven decisions across various operational contexts.

3. RESEARCH METHOD

This study employs a descriptive quantitative approach based on secondary data supported by interactive data visualization using Power BI. The main objective of this methodology is to identify user engagement patterns on viral content across various social media platforms in a multinational comparative framework by measuring interaction ratios and visualizing the data to support comprehensive interpretation.

3.1 Data Source and Collection

The dataset was obtained from Kaggle, titled Viral Social Media Trends and Engagement Analysis, with the last update in March 2025. Data retrieval occurred on April 30, 2025. The dataset is accessible at: https://www.kaggle.com/datasets/atharvasoundankar/viral-social-media-trends-and-engagement-analysis?resource=download. The dataset consists of a single fact table containing 5,000 rows and 10 columns, with a total file size of 401 KB in CSV format. Among the 10 columns, six are categorical data types, while the remaining four columns represent numerical interaction metrics: likes, shares, comments, and views. The CSV file was downloaded and subsequently converted into an Excel Workbook format to facilitate data preprocessing, particularly for format checking, data validation, and ensuring compatibility with Power BI for further analysis and visualization.

Figure 1. Data Collection Framework

The overall workflow of this process is illustrated in **Figure 1**, which presents a simplified framework of the research methodology. The figure outlines the data flow starting from Kaggle as the source platform, moving through file format conversion, and finally to data modeling and visualization in Power BI. This structured approach ensures both data integrity and analytical clarity throughout the research process.

3.2 Data Preparation and Processing

To ensure the reliability of the dataset prior to further transformation and visualization, a data quality assessment was conducted within the Power BI *Power Query Editor*. This involved using the Column Distribution and Column Profile features to inspect the structure and integrity of each column. As illustrated in **Figure 2**, these tools provide a summary of distinct values, value frequency, and the presence of null or empty cells across all columns.

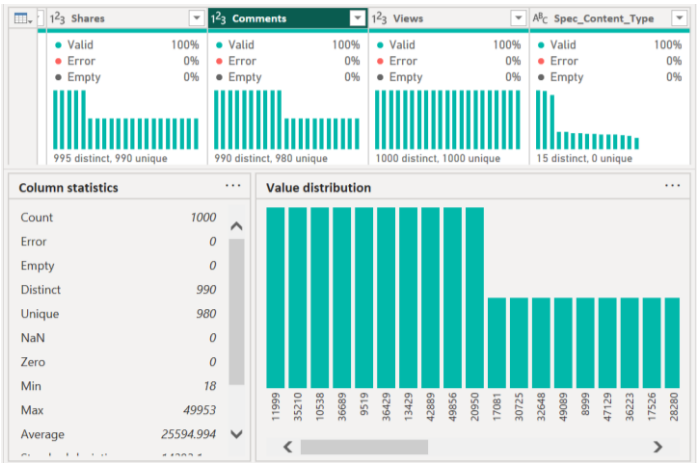

Figure 2. Data Quality Analysis through Column Profile and Distribution Tools in Power BI

The analysis revealed that all four numerical interaction columns, *shares*, *comments*, and *views*, contain valid numeric values with no missing or null entries. Categorical columns, Spec_Content_Type were also checked for consistency and completeness. The data was determined to be sufficiently clean and structured, thus ready for the next stages of preparation, including column transformation and master table creation. Initial data processing involved verifying data quality by checking for missing values, invalid data entries, and data type consistency. This step was essential to ensure data integrity before proceeding to advanced analysis. After importing the dataset into Power BI, several data transformation steps were undertaken:

a. Addition of New Columns

1) A combined "Platform_ContentType" column was created for more specific content classification (e.g., Instagram_Reels).
2) Calculation of engagement metrics including Like Rate, Comment Rate, Share Rate, and overall Engagement Rate.

3) Additional columns calculating the percentage contribution of key interaction elements such as hashtags, views, likes, comments, and shares.

b. Creation of Master Tables

1) A master table for Content Types to support content identification and sorting.
2) Four platform-specific master tables (Instagram, TikTok, X/Twitter, and YouTube) were developed for detailed platform-level analysis.
3) Each platform table included columns calculating interaction percentage elements to facilitate analysis by platform characteristics.

c. Data Model

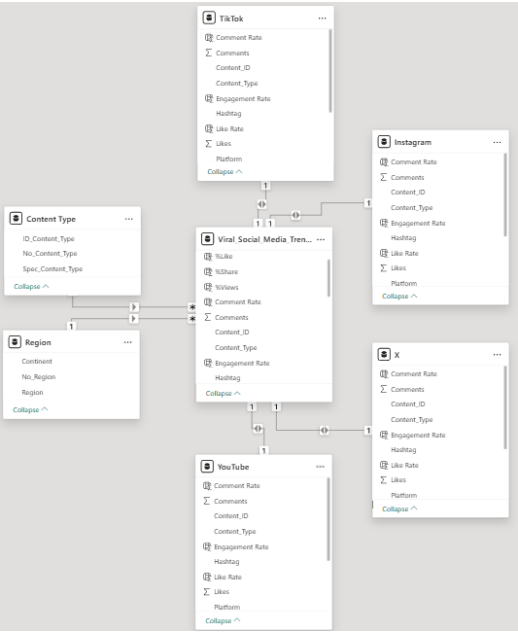

Figure 3. Data Model Viral Social Media Content

Using Power BI's Model View, relationships among tables were mapped to ensure data entities were correctly linked, supporting accurate visualization and analysis (**Figure 3**).

3.3 Data Visualization and Interpretation

The visualizations were organized into four interactive report pages in Power BI, each addressing a distinct analytical focus (see **Figure 4, Figure 6, Figure 8** in the Results and Discussion section):

a. Data Overview **(Figure 4)**

This section presents a comprehensive summary of interaction data across regions and platforms using Cards, Clustered Bar Charts, Filled Maps, Pie Charts, and Slicers. It emphasizes the absolute distribution of content and interactions, enabling high-level insights into volume and reach. Filters allow the combination of dimensions such as platform, region, and hashtag.

b. Interaction Averages and Ratee **(Figure 6)**

This section focuses on average interaction metrics such as Like Rate, Comment Rate, Share Rate, and overall Engagement Rate. Donut Charts are used to illustrate metric breakdowns, Clustered Column Charts compare averages across platforms, and Gauge Charts benchmark performance against dataset-wide means. Filters for region and platform provide targeted and comparative analysis.

c. Correlation Among Interaction Metrics **(Figure 8)**

This section analyzes statistical relationships between user interactions using a series of Scatter Plots and Correlation Coefficient Cards. It examines associations such as likes-to-views, shares-to-views, and comments-to-views, each segmented by region, hashtag, and content type. This enables identification of synergistic engagement behaviors, for instance, whether higher views correlate with increased shares or whether likes and comments show concurrent trends.

3.4 Visualization Refinement and Presentation

All visualization pages were carefully designed for clarity, aesthetics, and interactivity. Design considerations included color selection, iconography, and layout to ensure the dashboards are not only informative but also visually appealing and user-friendly for stakeholders.

4. RESULTS AND DISCUSSION

This section presents the key findings obtained from the interactive data visualization dashboard developed using Power BI. The dashboard serves not only as a medium for presenting data but also as an analytical tool that enhances comprehension of complex user interaction patterns across multiple social media platforms. By translating raw data into interactive visual narratives, the dashboard enables deeper insights into the dynamics of viral content and engagement behavior. The results are organized across three report pages:

1) Data Overview Page, provides an overall data overview, including distribution of content, user interactions, and regional presence.
2) Interaction Averages Page, explores the average interaction metrics in more detail and highlights content and platform-specific patterns.
3) Correlation Among Interaction Metrics Page, focuses on correlation analysis between key engagement indicators (likes, comments, shares) and views to assess the strength and consistency of relationships across regions, hashtags, and content types.

Each subsection combines visual observations with interpretive analysis to derive meaningful insights. Where relevant, scholarly perspectives are included to support the interpretations and contextualize the findings within recent academic discourse.

4.1 Data Overview

The first report page of the dashboard presents a high-level summary of viral content engagement patterns across eight countries and four major social media platforms, Instagram, TikTok, X (Twitter), and YouTube. The layout comprises 12 visual elements: nine card visuals, one pie chart, one clustered bar chart, and one Azure map, enhanced by three slicers for filtering based on Application, Country, and Hashtag.

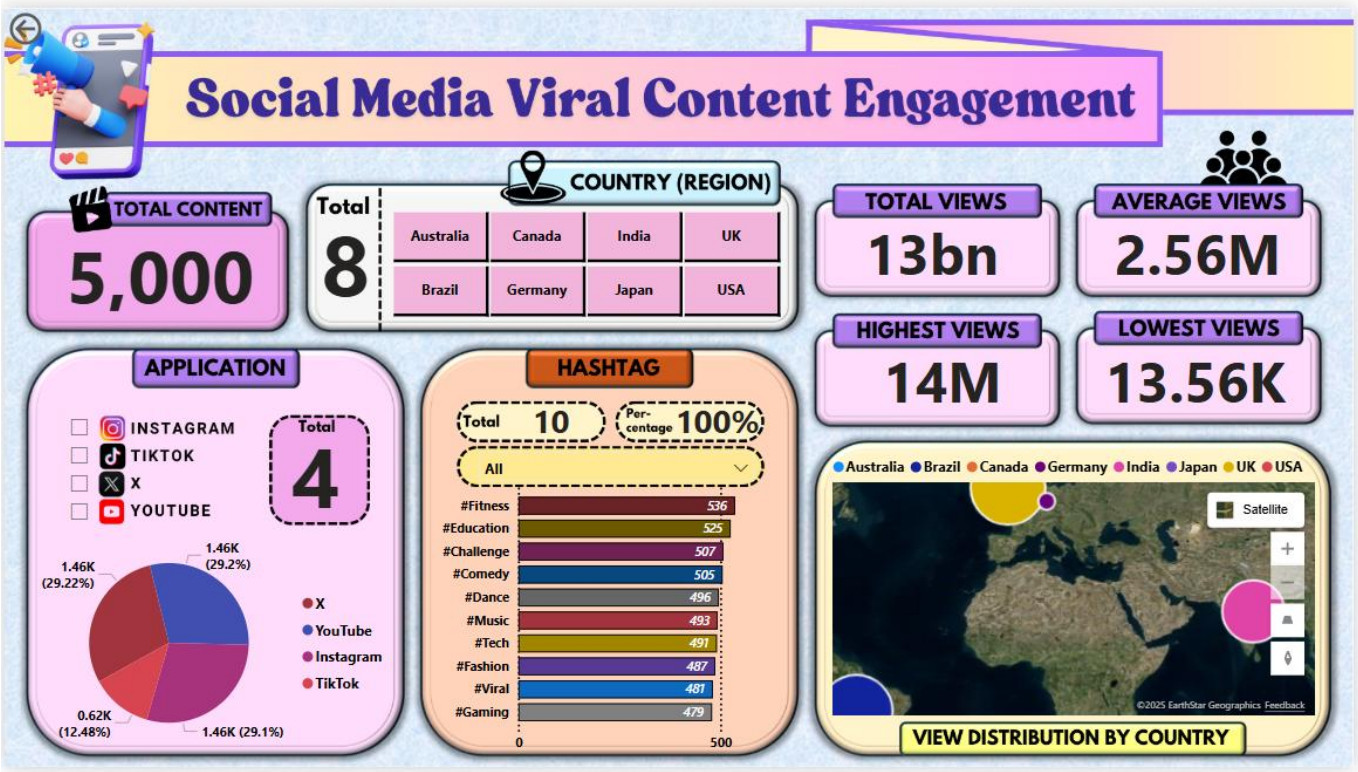

Figure 4. Social Media Viral Content Engagement (Part 1)

a. Key Visuals and Metrics

1) Card visuals display core aggregate statistics: total content, total views, average views, highest views, lowest views, total

region, total application, total hashtag, and percentage of hashtag contribution by frequency.

2) Pie chart: Lists four applications by total content, giving insight into dominant themes used in viral content.
3) Bar chart: Lists the top 10 hashtags by frequency, giving insight into dominant themes used in viral content.
4) Azure Map: Visualizes content distribution geographically. The eight countries included show varying levels of content presence, with the United States and India as the top contributors.
5) Slicers: The dashboard includes filters for Application (platform), Country, and Hashtag, enabling users to analyze interactions under specific or combined conditions (e.g., TikTok content in Japan using #music).

b. Emphasis on "Views" as a Highlight Metric

Among all the interaction metrics presented, views receive particular attention due to their role as the primary gateway to further engagement. View count reflects not only reach but also algorithmic amplification, as platforms tend to recommend content that gains initial traction (Digital News Report, 2023). Views are considered a more universal measure than likes or comments, which can be shaped by platform culture and design. According to Knight (2023), visibility and virality often begin with content exposure rather than user interaction. Therefore, understanding which posts get viewed the most is a critical step in identifying what triggers the viral loop.

This view-centric approach also helps bypass engagement disparities between platforms (e.g., liking norms on Instagram vs. sharing behaviors on X), making views an effective baseline for multinational comparative analysis (Pew Research Center, 2021).

c. Insights

Figure 4 presents a high-level summary of the dataset, offering an integrative view of viral content distribution and performance across platforms, countries, and thematic tags. The dashboard serves as an entry point into the dataset by visualizing key aggregate metrics and categorical distributions that establish the contextual foundation for subsequent analysis. From a volume standpoint, the dataset comprises 5,000 viral content entries sourced from eight countries: Australia, Brazil, Canada, Germany, India, Japan, the United Kingdom, and the United States. This geographic diversity enables comparative engagement analysis across distinct digital cultures and audience behaviors.

These viral content entries span across four major social media platforms, Instagram, TikTok, YouTube, and X (formerly Twitter). Based on the platform distribution visualized via the pie chart, Instagram, TikTok, and YouTube each contribute approximately 29% of the total content, indicating a balanced dominance among visual-first platforms. X, by contrast, contributes a significantly smaller share (12.48%), reflecting its limited multimedia virality potential compared to short-form video platforms.

In terms of audience reach, the dataset aggregates over 13 billion total views, with an average of 2.56 million views per content. The highest single content view count reached 14 million, while the lowest was 13.56 thousand, highlighting a wide spectrum of virality within the dataset. This variation underscores the importance of analyzing not just average performance, but also the outliers that often drive platform algorithms and user trends.

The hashtag breakdown reveals 10 dominant topical themes, with #Fitness leading as the most prevalent tag (appearing in 536 entries), followed closely by #Education, #Challenge, and #Comedy, each used in over 500 contents. This finding suggests that fitness and education-related content are particularly effective in driving virality across platforms, possibly due to their universal appeal and ability to be repurposed creatively by users.

The dashboard also features a filled map visualization, which displays the geographic distribution of content views. This visualization helps identify regional engagement hotspots. For instance, countries like the United States and Brazil appear to dominate in view volume, which may correlate with larger user bases or more active content ecosystems in those regions.

Additionally, the slicer panels provide interactive capabilities for filtering by country or platform, enhancing user control over data exploration. While not visible in the static figure, these features are essential in dynamic dashboard usage, enabling granular analysis per country or platform if desired.

Collectively, the visualizations in **Figure 4** offer a comprehensive overview of the dataset's scope, highlighting not only the quantitative scale of viral content but also its qualitative dimensions, such as theme, geography, and platform distribution. These foundational insights set the stage for deeper exploration into engagement performance, correlation dynamics, and strategic implications across different social media ecosystems

d. Function and Benefit

This interactive dashboard facilitates multi-dimensional analysis, allowing users to detect and interpret viral patterns across regions and topics. By applying slicers, stakeholders can explore practical insights, such as the top-performing hashtags in specific countries, the dominant platform for viral content in Japan, and comparative view counts for TikTok posts tagged #funny between Indonesia and Brazil. This capability transforms the dashboard from a static report into a strategic analysis tool, aligning with the principles of data storytelling and visual analytics outlined by Nussbaumer Knaflic

(2022). It empowers researchers, marketers, and policymakers to derive contextual insights from complex engagement data, an essential skill in the current era of information overload and digital noise.

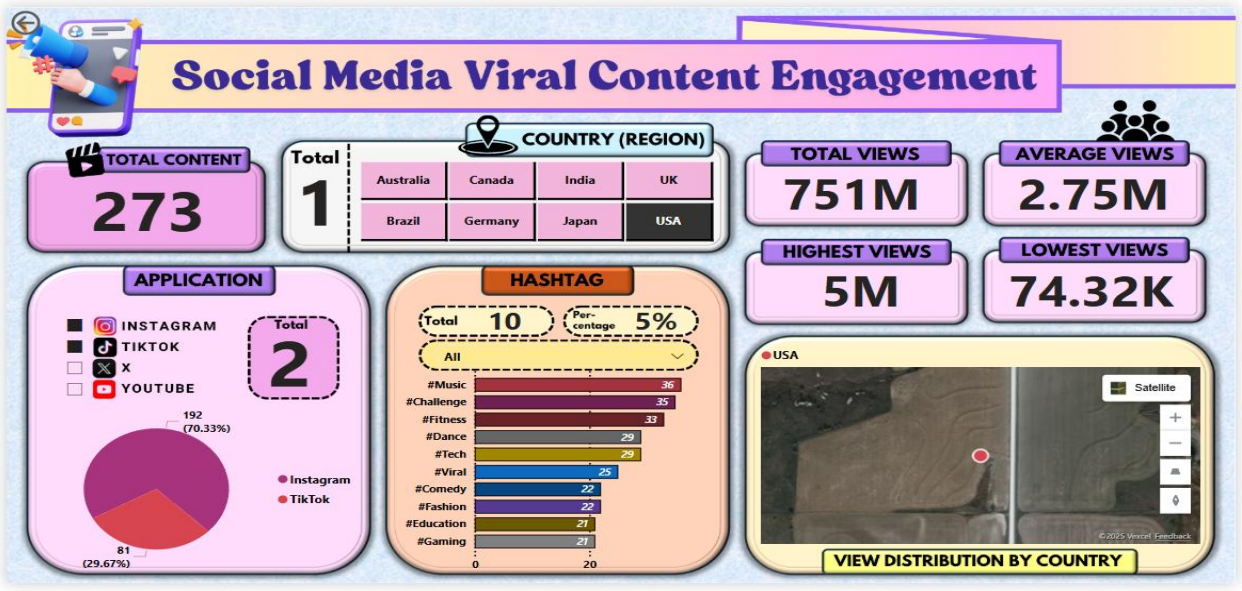

Figure 5. Social Media Viral Content Engagement (Part 1), Focused on Instagram, Tiktok, USA

To gain a more nuanced understanding of platform-specific engagement patterns, **Figure 5** isolates data pertaining to the United States, filtered through slicers for Instagram and TikTok, two of the most influential visual-centric platforms in the current social media landscape. This targeted analysis enables a clearer interpretation of how viral content performs within a single digital ecosystem characterized by mature user engagement and high content turnover.

Upon applying the filters, the total number of viral content entries originating from the USA and posted on either Instagram or TikTok is reduced to 273 contents, which still offers a robust sample size for evaluating cross-platform engagement behavior. Among these, Instagram dominates with 192 entries (70.33%), while TikTok accounts for the remaining 81 entries (29.67%). This disproportion suggests a relatively higher volume of viral content on Instagram, potentially attributable to its visual feed structure, discovery algorithms, or demographic alignment with American creators and audiences.

The filtered data reveals a cumulative total view count of 751 million, with an average of 2.75 million views per content. Notably, the highest individual content reached 5 million views, while the lowest-performing viral content still managed to secure 74.32K views. This reinforces the strong baseline visibility associated with viral status, even in the lowest quartile.

The relatively high average view count, coupled with a narrow gap between the lowest and highest extremes (compared to global data in **Figure 4**), suggests a more consistent engagement level within the US-based Instagram and TikTok ecosystem. This could be attributed to a combination of factors, including platform maturity, algorithmic reach, and content optimization practices among U.S. creators.

The top 10 hashtags reflect thematic patterns prevalent in viral content originating from this filtered subset. Leading the chart are: #Music (36 contents), #Challenge (35 contents), #Fitness (33 contents), #Dance (29 contents), #Tech and #Viral (29 and 25 contents respectively)

These tags suggest a strong user preference for dynamic, performative, and participatory content, which aligns with platform-specific formats like Instagram Reels and TikTok challenges. Interestingly, hashtags such as #Education (21 contents) and #Tech (29 contents) also rank highly, indicating that informational or value-driven content retains viral potential even on entertainment-heavy platforms.

The integrated map visualization confirms the USA as the selected country and provides a geographic anchor to the content origin. While the exact location is symbolic in this dashboard, the use of spatial mapping offers contextual orientation, especially in comparative analysis between regions. It could also inform future segmentation by sub-regions or state-level engagement in a more granular study.

The dashboard's use of Power BI slicers for country and application filters exemplifies a dynamic analytical framework. By enabling real-time adjustments, the slicers facilitate targeted data interrogation, allowing researchers or marketers to pivot between global and local trends, or compare performance across specific platforms and nations.

Filtering by USA, Instagram, and TikTok reveals a focused narrative: Instagram outpaces TikTok in content volume, but both platforms sustain relatively high engagement metrics within the U.S. market. The dominance of tags related to music, fitness, and challenges underscores the influence of trending audio, creator participation, and lifestyle aesthetics in shaping viral success. The slicer-enabled dashboard thus serves not only as a visualization tool but also as an interactive

decision-support system for audience-targeted content strategy.

4.2 Interactions Average and Rate

The second section of the dashboard is designed to provide a detailed overview of user interaction patterns with viral content across various social media platforms. Its primary focus is on *engagement metrics*, including average engagement rate and interaction ratios such as like rate, comment rate, and share rate. This section offers not only descriptive data but also enables comparative exploration based on region, hashtags, and application platforms through an interactive and structured layout.

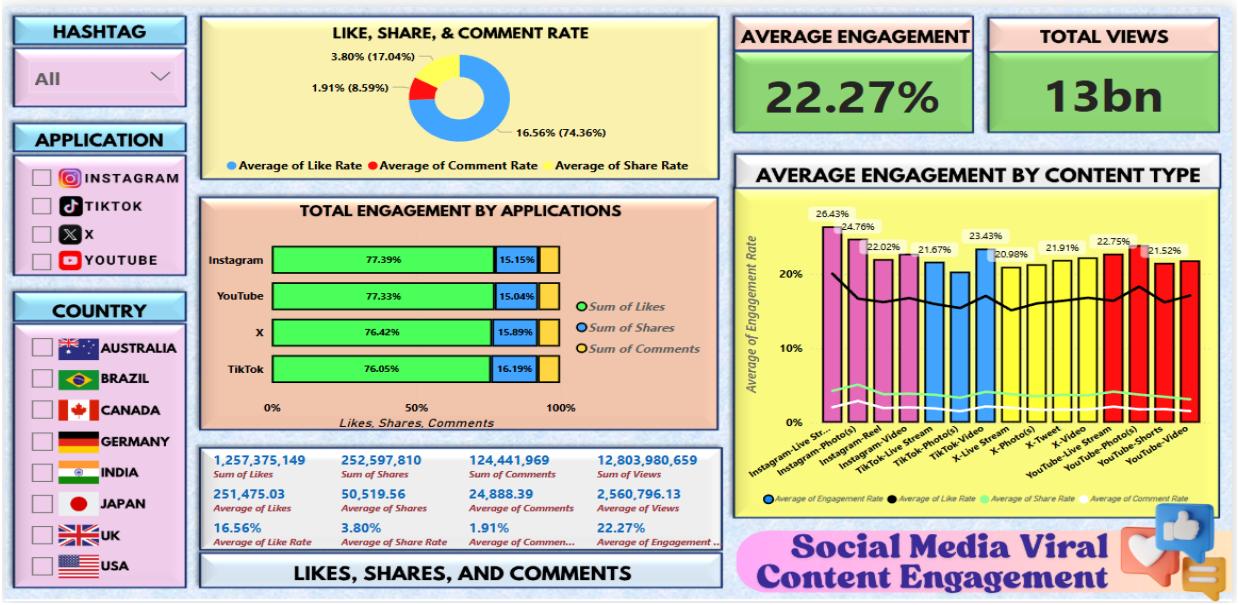

Figure 6. Social Media Viral Content Engagement (Part 2)

a. Key Visuals and Metrics

This section includes six primary visual components and three slicers:

- Visuals:
- 2 Cards (Average Engagement and Total Views)
- 1 Pie Chart (Distribution of Like Rate, Comment Rate, Share Rate)
- 1 Clustered Column Chart (Average Engagement by Content Type)
- 1 Stacked Bar Chart (Total Engagement by Application)
- 1 Multi-Row Card (Sum and Average for Likes, Shares, Comments, Views, and Engagement-related Ratios)
- Slicers: Hashtag, Region, and Application

b. Emphasis

The central emphasis of this section lies in understanding users' average engagement and the distribution of interactions across platforms and content types. By including recalculated metrics such as engagement rate (total interactions divided by total views), this section highlights the *quality* of engagement rather than just its quantity. This is crucial in today's digital media environment, where high view counts do not always equate to meaningful user interaction.

c. Insights

Figure 6 provides a comprehensive overview of viral content engagement across major social media platforms (Instagram, TikTok, YouTube, and X) based on global data totaling over 13 billion views. With an average engagement rate of 22.27%, the findings indicate a high level of user responsiveness to viral content across platforms, predominantly through actions such as likes, shares, and comments.

In terms of distribution, likes account for the largest portion, averaging 16.56% and contributing approximately 74.36% of total interactions. This suggests users are more inclined toward passive yet immediate responses to viral content. Conversely, the average share rate stands at 3.80% (17.04% of interactions), and the comment rate is even lower at 1.91%

(8.59%), indicating that active engagement, such as commenting or sharing, is still overshadowed by quick interactions like liking.

Among the four major platforms, Instagram and YouTube lead with the highest engagement rates, each contributing 77.39% and 77.33% of total interactions, respectively, followed closely by X (76.42%) and TikTok (76.05%). Although the differences are relatively minor, these figures affirm that Instagram and YouTube remain the primary platforms for capturing user attention, particularly through likes. Interestingly, TikTok shows the highest share rate at 16.19%, reflecting the platform's strength in virality through redistribution features such as “duet,” “repost,” and cross-platform sharing.

The bar chart panel on the right highlights that the highest engagement rates are associated with Instagram Live Stories (nearly 28%), followed by Instagram Photos and Reels. TikTok content, including TikTok Videos and Photos, ranks in the mid-range with engagement levels between 21% and 24%. Meanwhile, content from X, such as X-Videos, X-Streaming, and Tweets, shows flatter, lower engagement patterns compared to Instagram and TikTok. YouTube content, particularly Shorts, demonstrates a rising trend, outperforming standard videos, underlining the effectiveness of short-form formats in driving interaction.

In total, these platforms generated over 1.25 billion likes, 252 million shares, and 124 million comments. Instagram leads in like volume, while TikTok stands out in share activity. The average number of views per content item reached 2,560,796.13, indicating that viral content can rapidly reach millions of users.

Overall, this dashboard offers a holistic perspective on user engagement dynamics with viral content across different social media platforms. User preference for instant interactions such as likes dominates, with Instagram and YouTube emerging as the top platforms in terms of overall engagement rates. However, TikTok demonstrates a notable strength in shareable content with high viral potential, driven by its built-in redistribution features. The data also highlights the prominence of live stories and short videos in capturing user attention, emphasizing the critical role of content format and duration in today’s digital marketing strategies and content creation practices.

d. Function and Benefit

Functionally, this section supports in-depth data exploration for researchers, social media analysts, and decision-makers. By combining raw interaction metrics with calculated ratios, users can apply filters to analyze engagement behavior under specific contexts, such as tracking a particular hashtag’s performance in a region or comparing platform efficiency for similar content types. This approach aligns with the concept of *analytical storytelling* in data visualization. According to Berinato (2019) and Few (2020), effective visual narratives enable users to detect patterns and derive insights from data that might be hidden in traditional tables. This dashboard creates a space for exploratory analysis, helping users draw meaningful conclusions and better understand the dynamics of virality and user behavior.

To gain a more nuanced understanding of platform-specific engagement patterns, **Figure 6** presents a filtered view of the dashboard focusing on Brazil and the YouTube platform, offering a deeper exploration of user engagement patterns with viral video content in the country. With a total of 466 million views, Brazil emerges as a strategic market for globally viral YouTube content.

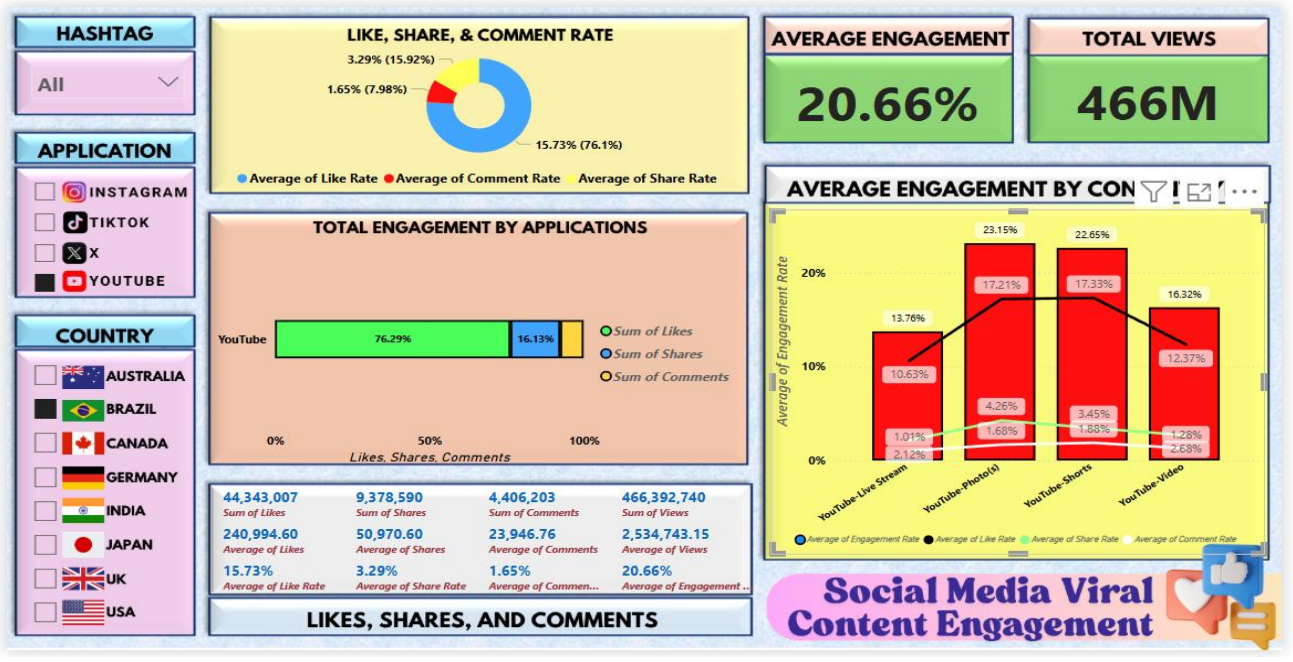

Figure 7. Social Media Viral Content Engagement (Part 2), Focused on YouTube, Brazil

To gain a more nuanced understanding, **Figure 7 shows** the average engagement rate for YouTube content in Brazil is recorded at 20.66%, slightly below the global multi-platform average of 22.27%, yet still relatively high. This indicates that Brazilian audiences are fairly active in responding to viral content published on YouTube.

The engagement composition is heavily dominated by likes, with an average rate of 15.73%, contributing approximately 76.1% of total interactions. Meanwhile, the share rate stands at 3.29% (15.92%), and the comment rate at 1.65% (7.98%). This pattern aligns with global trends, where users tend to engage passively, primarily through liking, rather than through more active interactions such as sharing or commenting.

In absolute terms, YouTube users in Brazil have generated: 44,343,007 likes, 9,378,590 shares, 4,406,203 comments. These figures demonstrate YouTube's ability to foster an active community, with over 58 million total interactions from just one country and one platform alone. The lower-right chart reveals that YouTube Shorts and YouTube Photos have the highest engagement rates, exceeding 22%, far surpassing other formats such as YouTube Live Streams (\~13%) and standard YouTube Videos (\~16%). This suggests that Brazilian audiences are more responsive to short-form and static visual content that can be quickly consumed, similar in style to TikTok or Instagram Reels but hosted on YouTube.

These findings underscore the importance of short-duration and visually-driven content formats in viral marketing strategies targeting Brazil. YouTube Shorts and Photos show the greatest potential for driving user interaction, making them optimal formats for brands and content creators aiming to engage Brazilian audiences. YouTube users in Brazil demonstrate a relatively high level of engagement with viral content, with a strong preference for short and visually appealing formats. The dominance of likes as the primary form of engagement highlights an audience inclination toward quick expressions of appreciation rather than deeper interaction through comments or content sharing. These insights suggest that content strategies targeting the Brazilian market should prioritize concise, visually engaging formats to align with local consumption behaviors.

4.3 Correlation Among Interaction Metrics

The third section of the dashboard is dedicated to examining the correlation between user interaction metrics, likes, comments, and shares, and content views. The purpose of this analysis is to understand how strongly these forms of engagement are associated with view counts across various dimensions such as region, hashtag, and content type. Through this correlation analysis, the dashboard aims to provide insights into the behavioral patterns of users and the drivers of content virality.

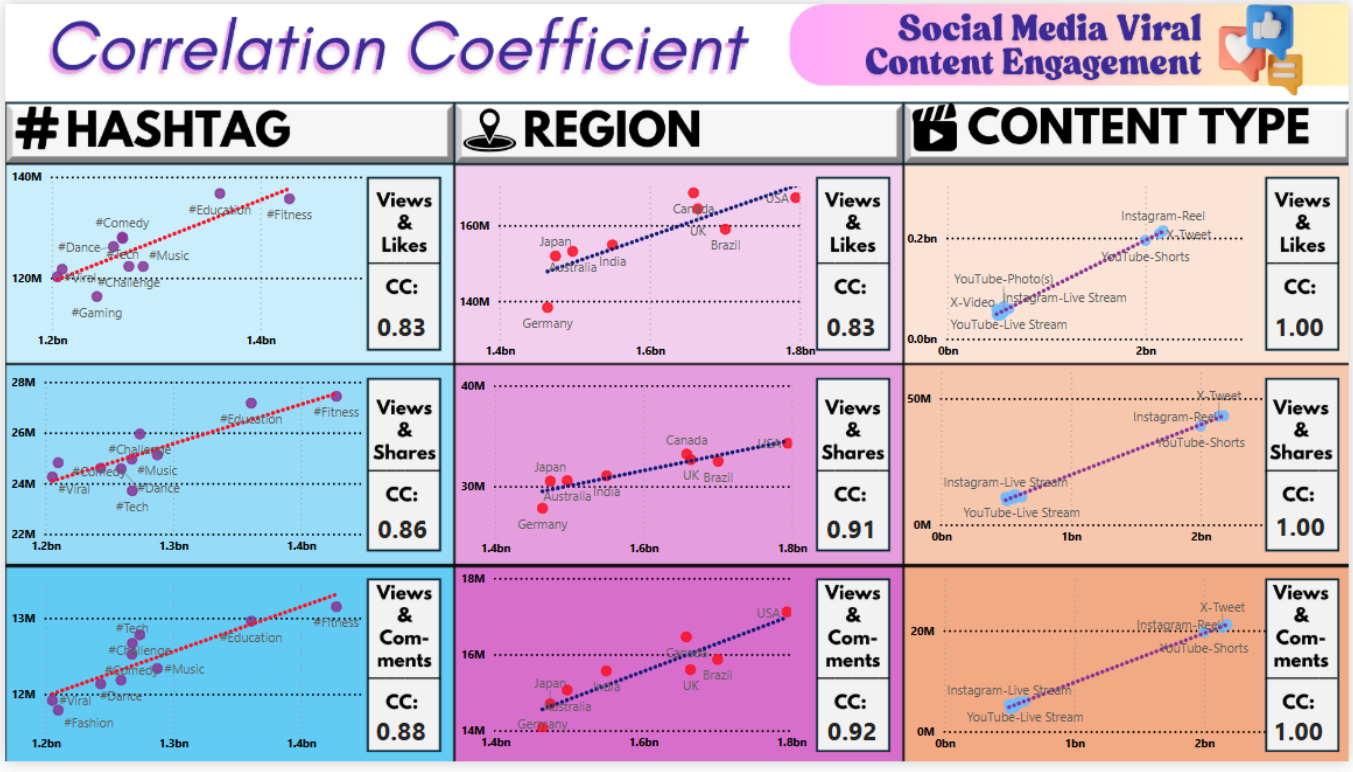

Figure 8. Social Media Viral Content Engagement (Part 3)

a. Key Visuals and Metrics

This section includes a total of 18 visual elements, consisting of:

- 9 Cards displaying the correlation coefficients (Pearson's r) for each pairing of interaction metric and views:
- Likes vs Views
- Comments vs Views
- Shares vs Views *(each measured across Region, Hashtag, and Content Type)*
- 9 Scatter Charts, corresponding to the metrics above, designed to visualize the linear relationship between each interaction type and view count.

Each scatter chart plots the interaction metric on the y-axis and the number of views on the x-axis, enabling a clear visualization of positive or weak correlations, as reflected by the calculated coefficient.

b. Emphasis

This section emphasizes the analytical depth behind viral content, not just how often users interact, but how closely those interactions are connected to content reach (views). A high correlation between likes and views, for example, may indicate content that consistently resonates with audiences, whereas a weaker correlation in comments or shares might suggest passive engagement or limited user response. By presenting correlation coefficients alongside visual scatter plots, this section bridges qualitative impressions and quantitative analysis, offering a more robust basis for understanding platform dynamics.

c. Insights

Initial observations show that likes generally exhibit a stronger correlation with views compared to comments or shares. This pattern is especially visible across platforms like Instagram and TikTok, where users tend to engage quickly through likes without necessarily sharing or commenting. On the other hand, comments and shares demonstrate weaker and more variable correlations, suggesting that these forms of engagement are influenced by other factors such as content type, emotional resonance, or platform norms.

When segmented by region, correlations can vary significantly, highlighting cultural differences in user behavior. For instance, certain regions may show a higher tendency to comment on content, while others may prefer passive interaction through likes. Similarly, when analyzed through hashtags and content types, the data reveals that some categories (e.g., educational or inspirational content) tend to receive more shares regardless of views, while entertainment content may garner views but less active sharing.

These insights align with research by Valerio and Mulken (2022), who found that engagement behavior is multidimensional and that interaction ratios such as engagement rate must be interpreted alongside contextual factors like platform culture and content format. Measuring engagement based solely on aggregate counts may mask deeper behavioral nuances.

Figure 8 illustrates the correlation between the number of views and various engagement metrics, likes, shares, and comments, across three key variables: hashtags, region, and content type. The analysis uses the Pearson Correlation Coefficient (CC) to measure the strength of the linear relationship, where values closer to 1 indicate stronger positive correlations. Based on the hashtag variable, the correlation between views and likes is 0.83, views and shares is 0.86, and views and comments is 0.88.

These findings show that the use of hashtags significantly influences engagement, with a particularly strong link between views and comments. This implies that carefully chosen hashtags not only help content reach a wider audience but also prompt users to engage in discussions. In the case of the region variable, the correlations are even stronger: 0.83 for views and likes, 0.91 for views and shares, and 0.92 for views and comments. This suggests that geographical differences and cultural contexts play an important role in shaping engagement behavior, especially in how users respond through sharing or commenting.

The most notable result appears in the content type category, where all three correlation coefficients are a perfect 1.00. This indicates that content type is the most dominant factor influencing engagement. Whether the metric is likes, shares, or comments, increases in views are perfectly matched by increases in these engagement forms when the content format is optimized. This result underscores the critical importance of selecting the right content type, such as short videos or visually appealing formats, when aiming to go viral. Taken together, the data shows that while all three variables influence engagement, content type has the most powerful and consistent impact, followed by region, and then hashtags. These insights suggest that virality and user interaction on social media are not merely organic outcomes, but are highly dependent on strategic factors such as format selection, regional adaptation, and thoughtful hashtag use.

d. Function and Benefit

Correlation analysis serves as a strategic tool for identifying which types of engagement are most responsive to reach (views), and where brands or creators might focus their optimization efforts. For instance, if shares exhibit a strong correlation with views in a certain region, marketers can tailor campaigns to encourage sharing in that audience segment.

Moreover, correlation-based insights are essential for validating engagement rate as a meaningful metric. While engagement rate (total interactions/views) is widely used, its reliability improves when supported by strong correlations among its

components. This diagnostic perspective ensures that engagement rates represent not just isolated spikes in metrics but sustained patterns of audience involvement.

According to Hoffmann and Novak (2021), interpreting social media performance through multiple lenses, such as ratios, trends, and correlations, yields a more comprehensive understanding of digital audience behavior, helping inform smarter decisions in content strategy and platform utilization

5. CONCLUSION

This study provides an in-depth analysis of user engagement trends in viral social media content by leveraging a data visualization dashboard designed to uncover actionable insights across platforms, countries, and content formats. With a total of 13 billion views analyzed and an overall average engagement rate of 22.27%, the data reveals compelling patterns that can inform more strategic digital content planning.

The dashboard not only visualizes surface-level metrics such as likes, shares, and comments but also dissects the deeper relationships between these variables and their drivers, namely hashtags, regional factors, and content types. One of the most significant findings is the perfect correlation coefficient (CC = 1.00) across all engagement metrics (likes, shares, comments) and views when analyzed by content type. This indicates that the nature of the content itself, such as YouTube Shorts, Photos, or Live Streams, has the strongest and most consistent influence on engagement outcomes. For instance, YouTube Shorts and Photos show superior performance in terms of eliciting user interactions, suggesting that creators should prioritize short-form, visually compelling formats for maximum reach and resonance.

At the regional level, strong correlations were also observed, particularly between views and comments (CC = 0.92) and views and shares (CC = 0.91), demonstrating that geographical context plays a critical role in shaping audience behavior. Content performance is not universally homogeneous; rather, it reflects the digital habits and cultural preferences of local audiences. This highlights the importance of geo-targeting and regional content adaptation in global social media campaigns.

Hashtags, while slightly less dominant in impact, still show high correlation values, such as 0.88 between views and comments, emphasizing their utility in expanding content discoverability and fostering community dialogue. Hashtag strategy, therefore, should not be overlooked, especially in campaigns aiming for organic virality.

Focusing further on the case of Brazil and the YouTube platform, the dashboard reveals that YouTube accounts for 76.29% of total engagements, making it the most impactful channel within the scope of this data. Brazil, a major digital market, contributes significantly to the engagement pool, aligning with global trends that position Latin America as a rapidly growing hub of digital consumption. In this filtered view, YouTube maintains a high like rate of 15.73%, affirming its dominance as a platform not just for visibility but for meaningful interaction.

The dashboard itself proves to be an invaluable tool in transforming raw data into strategic insight. By integrating slicers and interactive filters (such as by country, platform, and hashtag), users can instantly refine their view and extract relevant patterns based on their campaign objectives. The dynamic visualization of correlation coefficients allows for deeper understanding of causality and interaction strength among metrics, empowering marketers, analysts, and content creators to move beyond assumptions and base their strategies on quantifiable trends.

Ultimately, this dashboard does more than just present engagement numbers, it functions as a decision-support system. It aids in content optimization, audience segmentation, platform prioritization, and performance forecasting. For marketers and content creators aiming to boost engagement, the key takeaway is clear: virality is not merely a function of luck or timing; it is a data-driven outcome influenced by the right mix of content type, regional targeting, and metadata strategies such as hashtagging. By harnessing tools like this dashboard, teams can design smarter campaigns, deliver more resonant content, and create social experiences that not only reach but deeply engage their audiences.

RECOMMENDATIONS

Based on the findings of this study and the insights derived from the interactive dashboard, several strategic recommendations can be made to guide future content planning, social media engagement strategies, and data-driven decision-making:

1. Prioritize Short-Form and Visual Content Types

Given the perfect correlation between content types and engagement metrics, it is recommended to focus on formats that drive high interaction, particularly short-form video content like YouTube Shorts and Instagram Reels, as well as visually rich formats like Photos and Live Streams. These formats consistently yielded higher engagement rates, indicating strong user preference and responsiveness.

2. Implement Region-Specific Content Strategies

The significant variations in engagement across countries suggest that localized strategies are essential. For example, Brazil

showed outstanding interaction levels, especially on YouTube. Brands and content creators should therefore invest in regionally tailored campaigns that align with local cultural dynamics, digital behaviors, and platform popularity.

3. Optimize Hashtag Use with Data-Driven Selection

Although not as dominant as content type or region, hashtags still demonstrate high correlation with interaction metrics. It is advisable to use relevant, high-performing hashtags, such as #Fitness, #Challenge, or #Comedy, based on data trends, and avoid overused or unrelated tags. Additionally, continuous monitoring of trending hashtags is crucial for real-time campaign optimization.

4. Leverage Data Correlation Insights for Platform-Specific Tactics

The dashboard revealed different behavioral patterns across platforms. For instance, Instagram and TikTok perform well in the U.S., while YouTube dominates in Brazil. Marketers should adjust content types, posting times, and messaging styles based on platform-specific trends revealed by the correlation data.

5. Use the Dashboard as a Decision Support Tool

The dashboard's ability to slice data by region, platform, and hashtag provides highly targeted insights. Stakeholders should regularly use and update the dashboard as a living analytics tool to support campaign planning, evaluate post performance, and fine-tune strategies dynamically. The correlation matrix and visual metrics can serve as early indicators of what types of content are likely to go viral.

6. Invest in Continuous Data Enrichment and Monitoring

To maintain relevance and accuracy, it is important to continually enrich the dataset with new viral content across platforms. Integrating real-time or monthly data updates will enhance the dashboard's predictive value and ensure that the strategies remain aligned with evolving trends in user behavior and platform algorithms.

7. Educate Content Teams on Data Interpretation

The insights from this study are only as powerful as the teams interpreting them. It is recommended to train content creators, social media specialists, and campaign managers in basic data literacy and dashboard usage, ensuring that data-informed strategies become embedded in daily decision-making.

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AUTHOR'S CONTRIBUTIONS

All authors discussed the results and contributed to the start to final manuscript.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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