UNVEILING KEY METRICS OF AUDIENCE ENGAGEMENT AND REVENUE GENERATION

DASHBOARD CONSTRUCTION NOTEBOOK

Report by: Group 3

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Background

In the era of digital content creation, YouTube has emerged as one of the most dominant platforms for sharing videos and connecting with audiences worldwide. Content creators rely heavily on understanding viewer behavior and platform analytics to maximize engagement and generate revenue. Metrics such as views, likes, shares, and advertising revenue are pivotal in determining a video's success. However, the complexity of these metrics often leaves creators struggling to identify actionable insights to improve their performance and achieve financial sustainability.

Introduction

This project aims to delve into the intricacies of audience engagement and revenue generation for YouTube content. By analyzing key performance metrics, we seek to uncover patterns and relationships that can help content creators optimize their strategies for greater impact. The study focuses on metrics such as Impressions, Ad impressions, Views, Revenue sources, Monetized playbacks, Video Thumbnail CTRs, and watch times, offering a comprehensive view of how these factors contribute to a video's success.

Objective

The primary objective of this research is to **provide a comprehensive analysis of audience engagement and revenue performance** on YouTube across various content categories. Specifically, the study aims to:

- Analyze the relationship between engagement metrics (likes, shares, comments) and video performance.
- Identify the impact of various factors (Video publish time, Ad impressions, and click-through rates) on total revenue.
- Examine audience behavior through watch time, view duration, and click-through rates to determine their influence on video success.
- Uncover actionable insights to enhance viewer interaction by improving engagement metrics such as likes, comments, and shares.
- Optimize monetization strategies to maximize earnings through targeted improvements in ad performance and premium revenue streams.

Data Preparation

Data Source:

The dataset used for this analysis was sourced from the publicly available YouTube Channel Performance Analytics dataset on Kaggle. This dataset provides essential information about YouTube video performance, including video views, watch time, impressions, video duration, click-through rate (CTR), and revenue across multiple video categories, such as Education, Technology, Fashion, Food, and more.

Here is the snapshot of the Raw Data:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	ID	Video Publish Time	Views	Revenue from Views ($)	Impressions	Monetized Playbacks	Comments	Shares	Likes	Subscribers	Video Duration	Average View Percentage (%)	Watch Time (hours)	Video Thumbnail CTR (%)
2	1	Wednesday, 1 June, 2016	5155	3481.84	257743	0.449007569	52	26	222	133	196	44.00	12255.473	7.00
3	2	Thursday, 2 June, 2016	23531	2323.54	41118	723	91	12	924	51	201	40.38	533.1636	27.66
4	3	Friday, 10 June, 2016	11478	283.79	41627	727	35	5	322	33	391	39.85	500.5628	5.85
5	4	Tuesday, 14 June, 2016	6153	2762.74	38713	76	0	4	239	8	133	30.88	70.7287	7.07
6	5	Tuesday, 21 June, 2016	15643	4052.31	782128	3451	156	78	673	77	119	40.00	14378.294	9.00
7	6	Wednesday, 29 June, 2016	4398	743.31	35245	18	12	7	220	2	14	103.05	17.6251	5.6
8	7	Friday, 1 July, 2016	14659	12812.47	46218	0	50	7	602	28	45	55.7	104.3341	8.62
9	8	Friday, 8 July, 2016	8415	2445.96	40395	491	27	3	290	19	496	36.7	425.4773	5.09
10	9	Monday, 18 July, 2016	5094	310.37	254683	19569	51	25	219	31	104	34.00	10533.000	9.00
11	10	Monday, 1 August, 2016	6133	2488.36	306670	2	61	31	264	113	126	51.00	12301.419	7.00
12	11	Friday, 5 August, 2016	4330	1055.86	34250	32	16	14	151	4	9	117.3	12.6979	4.67
13	12	Monday, 8 August, 2016	10048	7571.06	39866	404	33	37	441	24	34	101.52	98.9192	7.31
14	13	Thursday, 11 August, 2016	8188	3885.53	37186	127	37	21	241	14	11	75.52	18.8953	6.83
15	14	Friday, 12 August, 2016	4389	2396.58	33920	44	15	3	121	5	14	91.03	16.647	4.36
16	15	Friday, 12 August, 2016	2591	1827.14	129544	0	26	13	111	131	161	41.00	7812.016	6.00
17	16	Wednesday, 17 August, 2016	6209	4172.94	37207	199	0	11	255	11	29	79.64	41.2094	5.13
18	17	Sunday, 21 August, 2016	7748	4762.85	387379	25163	77	39	333	82	77	68.00	21145.852	6.00
19	18	Wednesday, 24 August, 2016	6159	2687.99	307958	15777	62	31	265	111	51	67.00	8146.000	7.00

The dataset contains many important columns needed to extract insights about key engagement drivers and revenue influences. The important columns utilized in further exploration are as follows:

- ID: Unique identifier for each video.
- Video Publish Time: The date and time when the video was published.
- Category: The thematic category of the video content.
- Views: Total number of views the video received.
- Revenue from Views: Total revenue generated from views in USD.
- Impressions: The total number of times the video thumbnail was shown to potential viewers.
- Monetized Playbacks: Approximate number of views where ads were shown.
- Total Cost of Advertising: Cost incurred for advertising the video.
- Ad Impressions: Total number of ad impressions generated by the video.
- Estimated AdSense Revenue (USD): Revenue earned from AdSense advertisements.
- DoubleClick Revenue (USD): Revenue generated through DoubleClick ads.
- YouTube Ads Revenue (USD): Earnings from YouTube ads in total.
- Watch Page Ads Revenue (USD): Revenue specifically from ads displayed on the video's watch page.
- YouTube Premium (USD): Earnings from YouTube Premium subscribers watching the video.
- Comments: Number of comments received on the video.
- Shares: Number of times the video was shared.
- Likes: Total likes received by the video.
- Subscribers: Net subscriber change associated with the video.
- Video Duration: Length of the video in seconds.
- Average View Percentage (%): Percentage of the video watched on average by viewers.

- Video Thumbnail CTR (%): Click-through rate for the video thumbnail.
- Total Revenue*: Total earnings from the video across all sources
  **Calculation:*
  Revenue from Views + AdSense Revenue + Double-click Revenue + YouTube Ads Revenue + Watch PageAds Revenue + YouTube Premium Revenue

Data Cleaning:

The raw dataset contained multiple columns with varying levels of data quality. Before analysis, the following steps were undertaken to ensure data quality and consistency:

1. Missing Values: Rows with missing values were identified and removed to avoid inaccurate interpretations.
2. Data Types: Data types were verified to classify categorical and numerical fields properly.
3. Outliers: Outliers in continuous variables (like revenue and views) were addressed to reduce the impact of extreme values on the analysis.
4. Duplicate Rows: Duplicate entries were identified and removed to maintain the integrity of the dataset.
5. Data Standardization: Date and time formats were standardised to ensure uniformity in time-series analysis.

Once data cleaning was complete, the dataset was ready for visualisation and analysis within Tableau.

Pitch Question

As we explore the construction of the dashboard, our primary focus was the Engagement metrics and revenue possibilities. So, the initial question that we wanted to address was: ***Which are the key drivers of YouTube video engagement, and how do they influence revenue generation for different categories?***

This question forms the basis for exploring the relationship between engagement and revenue across content categories and addresses the core challenge faced by content creators in understanding how audience engagement metrics, such as views, likes, and comments, impact revenue. Additionally, it seeks to uncover whether factors like video duration, publishing time, and category type play a role in maximizing monetization opportunities. Key drivers include:

- **Content Categories:** Understanding high-performing genres like Education and Health.
- **Video Length:** Evaluating viewer retention patterns.
- **Ad Impressions:** Analyzing their impact on revenue.
- **CTR and Thumbnails:** Assessing how click-through rates influence visibility.
- **Publishing Schedules:** Determining optimal days for engagement and revenue.

To address the pitch question effectively, it is important to dissect the broad inquiry into focused sub-questions. These sub-questions investigate specific relationships between key metrics such as video views, ad impressions, engagement rates, and revenue. The analysis leverages a set of comprehensive visualizations that help uncover patterns, trends, and actionable insights. By exploring these relationships, this research identifies the metrics that significantly drive engagement and revenue, offering a roadmap for content creators to refine their strategies.

Exploratory Analysis

1. Which metrics provide a holistic snapshot of audience engagement and revenue performance?

Objective: To provide a concise summary of key performance indicators (KPIs) related to audience engagement and revenue.

As the tabular format is ideal for presenting multiple metrics simultaneously without overwhelming the audience, offering an at-a-glance understanding of performance, we decided to create an Overview table, which is as follows:

Key Metrics Overview			
Views	**Likes**	**Shares**	**Revenue**
48,187,200	2,067,801	98,597	23,120,472

The Key Metrics Overview table provides a snapshot of the channel's overall performance, offering a high-level summary of critical metrics:

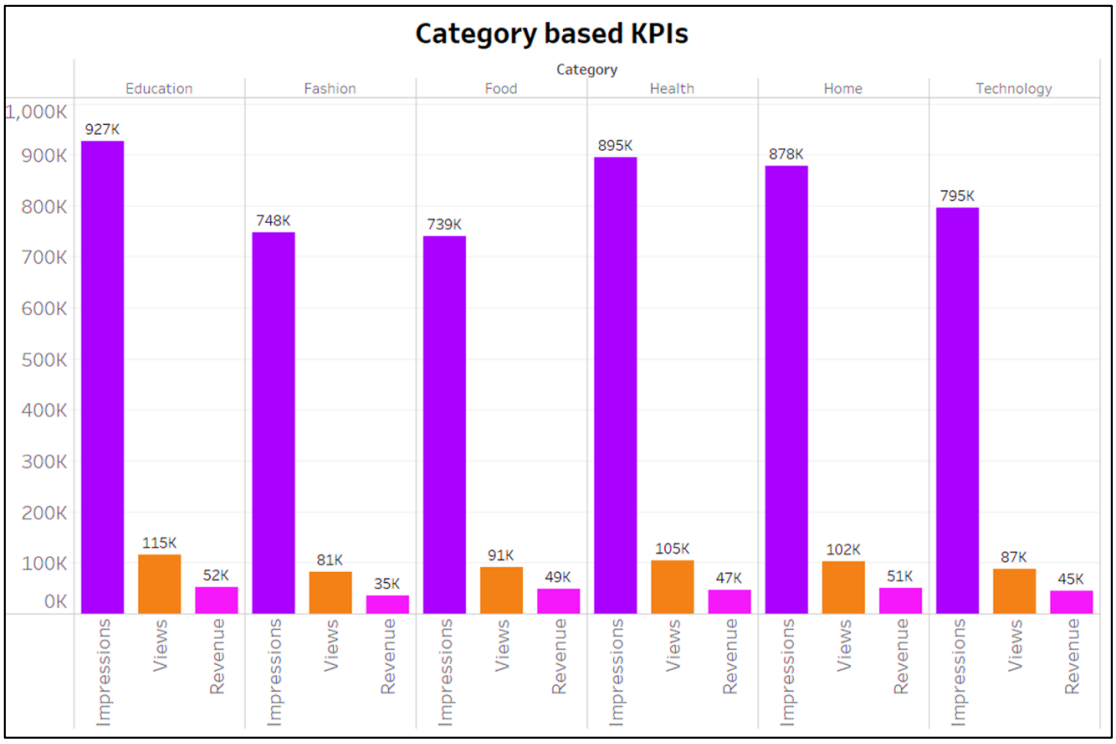
- With over 48 million views, the dataset underscores the substantial reach of the channel. This reach is further complemented by a strong engagement base, evidenced by more than 2 million likes and nearly 100,000 shares, demonstrating a highly interactive audience.
- The total revenue of $23 million highlights the platform's lucrative potential, derived from a combination of revenue from views, advertisements, monetized playbacks, and premium views.

These metrics not only provide an overview of the channel's success but also serve as a foundation for deeper analyses into audience behavior and monetization opportunities. Together, they highlight the channel’s ability to attract viewers, foster engagement, and generate significant revenue.

2. How do impressions, views, and revenue vary across different video categories?

Objective: To compare engagement and revenue metrics across categories like Fashion, Technology, Food, etc.

A category-wise breakdown of KPIs is essential to highlight variations in engagement and revenue across different content types. A quick comparison of impressions, views, and revenue for categories allows content creators to get a snapshot of metrics. As the "Bar Chart" is the best choice for comparing the performance across categories, we delved into creating the following chart for Category based KPIs:



The analysis of KPIs by category sheds light on the performance of various content types in driving both engagement and revenue:

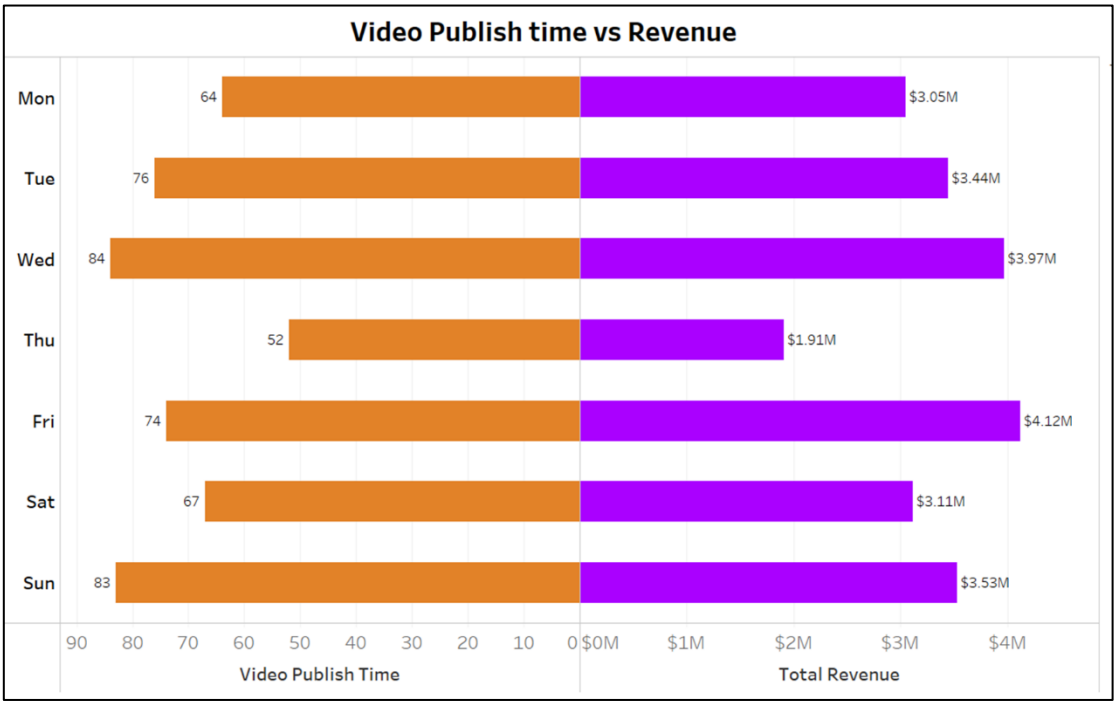
- Categories like Education and Health lead the pack, with Education generating an average revenue of $51,707 per video and achieving the highest average ad impressions and views. Similarly, Health follows closely, with significant engagement and revenue figures. These categories excel due to their broad appeal and consistent relevance to audiences.
- On the other hand, Technology, despite a respectable 795,114 average ad impressions, underperforms in revenue with $44,921 on average. This discrepancy suggests that while the category captures attention, it struggles with monetization, possibly due to shorter retention times or less engaging content.

The insights from this analysis emphasize the importance of aligning content categories with monetization strategies to optimize revenue generation.

3. Does the day of the week affect revenue generation for videos?

Objective: To analyze if day of video publishing influences revenue generation and to identify the most impactful days for publishing content for more revenue.

A diverging bar chart is effective when it comes to comparing two values across two categories. It allows the visualization of two variables, making it clear which days outperform others in revenue generation.



The analysis of Video publish time and revenue reveals distinct patterns:

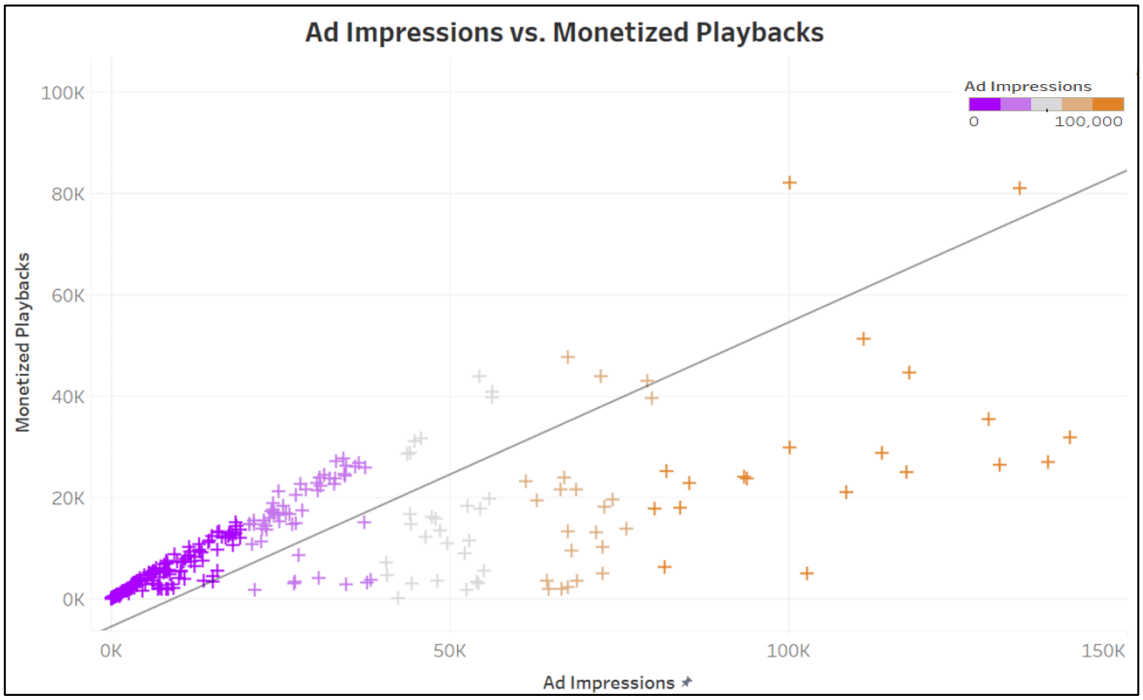
- Friday emerges as the standout performer, generating $4.12 million in revenue. Wednesday follows closely, with revenue figures of $3.97 million, suggesting that midweek uploads are strategically advantageous for maximizing impact.
- In contrast, Thursday underperforms, with revenue of only $1.91 million.

These findings emphasize the importance of timing in content publishing. Creators can leverage high-performing days like Friday and Wednesday to reach larger audiences and achieve better monetization outcomes. This insight highlights how minor scheduling adjustments can yield significant improvements in performance.

4. What is the relationship between ad impressions and monetized playbacks?

Objective: To understand the relationship between ad impressions and monetized playbacks.

A scatter plot is the best choice to reveal relationships or correlations between two continuous variables, in this case, ad impressions and monetized playbacks. It effectively visualizes trends, clusters, or outliers in the data.



A positive correlation is observed, indicating that higher ad impressions often lead to increased monetized playbacks. Some of the highlights are:

- Videos with 50k+ ad impressions consistently generate over $30,000 in revenue, while those reaching 150,000 impressions achieve revenues exceeding $90,000.
- However, diminishing returns are observed at extremely high impression levels, suggesting that other factors, such as viewer engagement and CPM rates, also play a role in determining revenue.

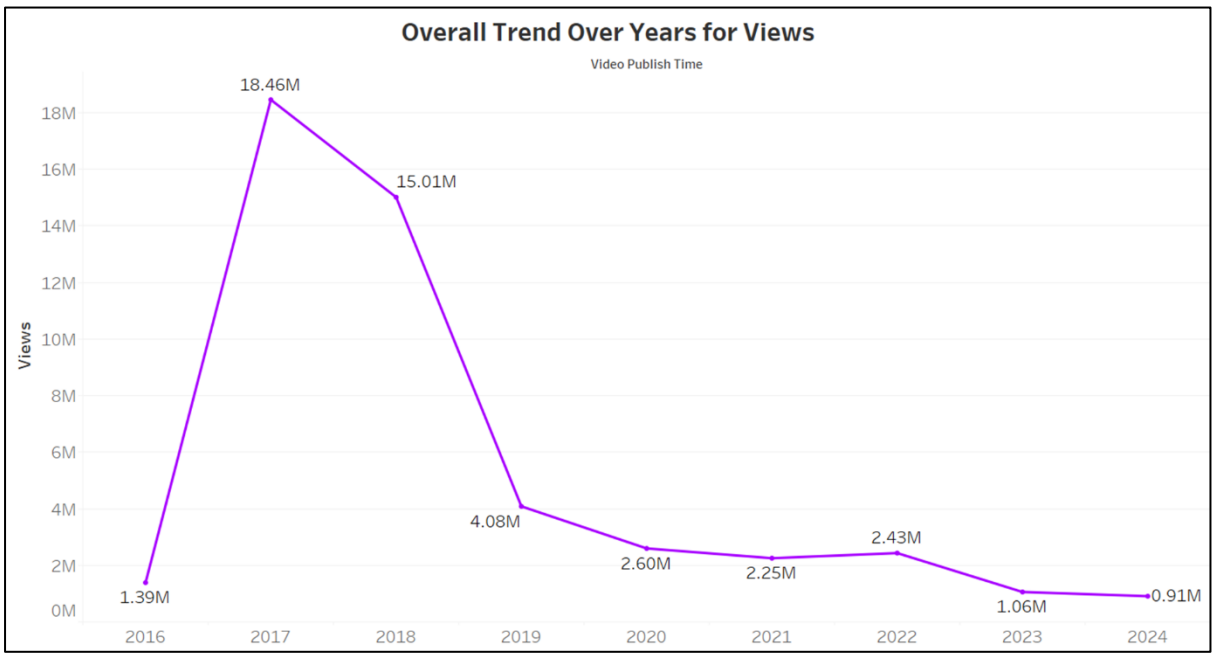
This analysis underscores the importance of optimizing ad placements to maximize impressions and balance them with viewer satisfaction for sustained revenue growth. Creators can focus on optimizing ad placements to maximize monetization.

Since most of the total revenue is driven by video views, we focused our analysis on understanding the factors influencing views. This approach aimed to identify the key elements impacting revenue through a deeper exploration of video viewership patterns.

5. How have views trended over the years for the analyzed videos?

Objective: To analyze the trend in video views over time.

A line chart is ideal for displaying trends over time, allowing viewers to see fluctuations in views across different years. It provides a clear picture of long-term patterns and helps identify growth or decline. A line graph was created, with years on the X-axis and total views on the Y-axis, plotting the data points for each year.



Views have shown fluctuating trends, with noticeable peaks in certain years, reflecting changes in content strategy or platform algorithms:

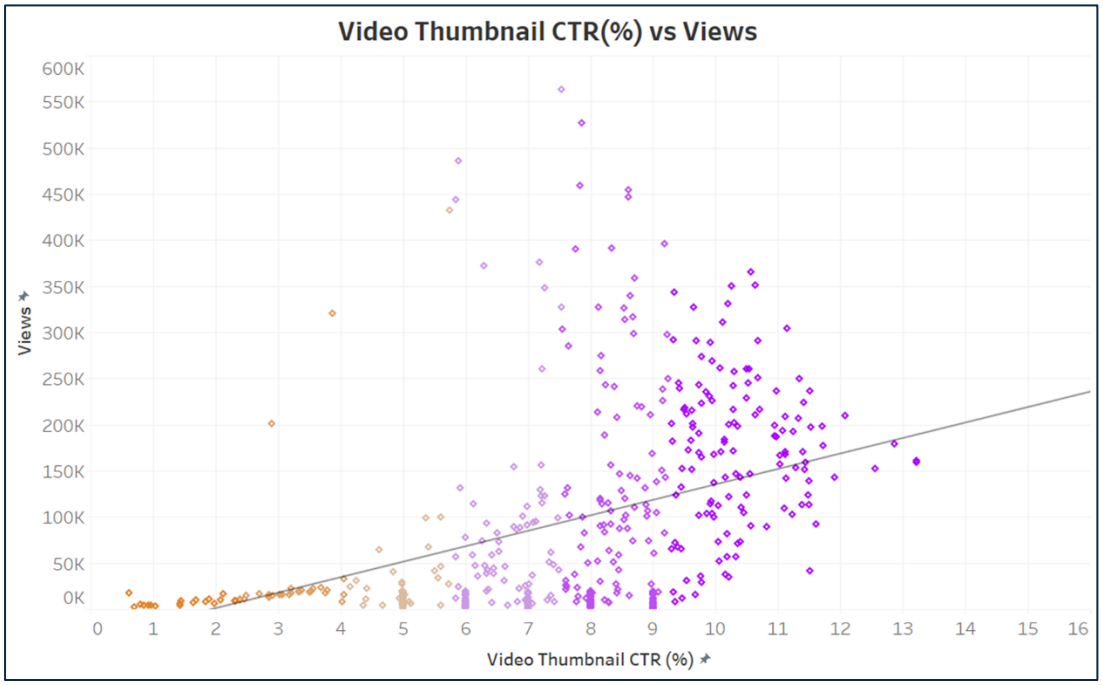
- From a modest starting point of 1.39 million views in 2016, viewership saw a dramatic rise, peaking at 18.46 million views in 2017. This period of growth aligns with YouTube's expanding global reach and increasing content diversity, enabling creators to attract larger audiences.
- However, post-2017, a sharp decline in views is evident, dropping to 15.01 million in 2017 and further to 908,000 by 2024.

This decline suggests shifts in audience preferences or increased competition, signalling the need for re-engagement strategies. The analysis underscores the importance of adapting to evolving audience preferences and platform policies to sustain long-term growth.

6. Does the click-through rate of video thumbnails correlate with views?

Objective: To explore whether video thumbnail click-through rates influence view counts.

A scatter plot is well-suited for understanding the relationship between video thumbnail CTR (%) and views. It highlights how effective thumbnail click-through rates are in driving video traffic, helping identify patterns or anomalies. A scatter plot was used, with CTR on the X-axis and total views on the Y-axis, adding the colour-coded data points. A trendline was added to show the linear relationship between CTR and views.



The positive trendline shows that videos with higher thumbnail CTRs generally achieve higher views, showcasing the importance of attractive thumbnails. Key points to note are:

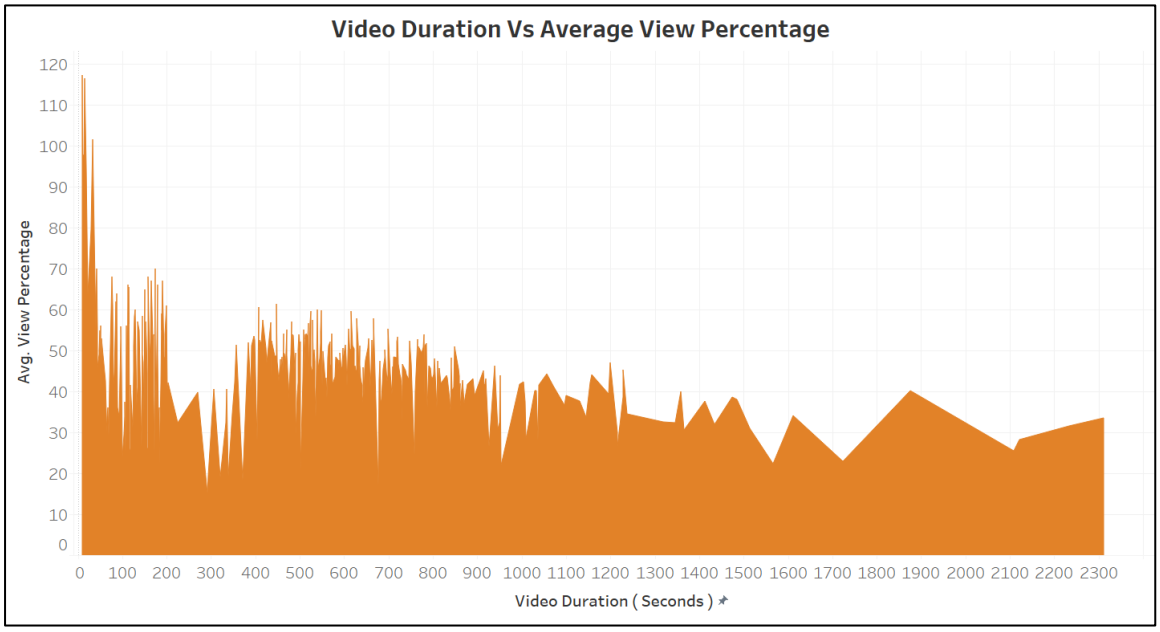
- Videos with CTRs above 10% achieve average view counts exceeding 200,000, with some even reaching 600,000 views.
- Conversely, videos with CTRs below 5% struggle to cross 100,000 views, reflecting the critical role of thumbnails in capturing audience attention.

This strong positive correlation highlights that investing in compelling, visually appealing thumbnails can significantly boost visibility and engagement. Creators should focus on designing thumbnails that not only attract clicks but also align with video content to ensure sustained audience interest. This insight reinforces the need for strategic visual elements in content marketing.

7. What is the relationship between video duration and average view percentage?

Objective: To investigate the relationship between video duration and viewer retention.

An area chart is effective for showing cumulative distribution and comparing the relationship between video duration and average view percentage. It provides an intuitive way to understand how viewer retention changes with longer or shorter videos. We created Area Chart with video duration (in seconds) on the X-axis and average view percentage on the Y-axis to visualize the fluctuation in View percentage with changing video duration.



As it can be observed from the chart, longer videos often have a lower average view percentage, but shorter videos see better retention rates. Key observations are:

- Shorter videos, those under 200 seconds, consistently achieve retention rates of 75-85%, indicating that viewers are more likely to complete concise content.
- Medium-length videos (300-900 seconds) see retention rates drop to 50-65%, while longer videos (over 15 minutes) struggle to retain even half of the audience.

This clear negative correlation between video length and retention highlights the need for creators to balance content depth with viewer attention spans. Shorter videos not only perform better in retaining audiences but also create opportunities for repeat views, which can amplify both engagement and revenue. This insight suggests that optimizing video duration is crucial for maintaining audience interest.

The Tableau Dashboard integrates all of the above visualizations into a cohesive and interactive framework, providing a comprehensive overview of YouTube video

performance metrics. Each visualization addresses specific aspects of audience engagement and revenue generation, while the dashboard unifies these insights for holistic decision-making. (*Exhibit A*)

Conclusion

The project focused on leveraging Tableau to create a dashboard that provides actionable insights into YouTube video performance, enabling data-driven decisions to optimize audience engagement and revenue generation. The visualizations presented in the dashboard empower users to uncover patterns and relationships between key metrics, offering an intuitive way to make informed strategic choices.

The Tableau Dashboard successfully highlights:

- **Audience Engagement**: Metrics such as comments, shares, likes, and average view duration were strong indicators of video performance. Videos with higher viewer engagement rates tended to perform better in terms of views and revenue generation, underscoring the importance of fostering interactive content.
- **Revenue Generation**: Video monetization was influenced by multiple factors, including impressions, monetized playbacks, and ad click-through rates. Ad Impressions showed a positive correlation with Monetized Playbacks, confirming the importance of optimizing ad placements.
- **Category Insights**: Certain categories outperformed others in terms of revenue and impressions. For example, **Technology** videos exhibited higher revenue per view, while **Fashion** videos showed varied engagement patterns but performed well in terms of impressions.
- **Video Publish Time**: The diverging bar chart revealed clear trends in how video publishing times influenced revenue. Specific days, such as Wednesdays and weekends, showed higher earnings, likely due to increased audience availability.
- **Thumbnail Effectiveness**: The scatter plot of Thumbnail CTR (%) vs. Views demonstrated a strong link between visually compelling thumbnails and higher video views. This suggests that an optimized thumbnail strategy is crucial for driving traffic.
- **Video Length and Retention**: Videos with shorter duration showed higher average view percentages, while excessively long videos exhibited declining retention rates.

By consolidating these insights into an interactive dashboard, this project provides a user-friendly tool for content creators and decision-makers to refine their strategies for better outcomes.

Recommendations

Based on the insights derived from the Tableau Dashboard, the following recommendations are proposed to enhance YouTube video performance:

- **Optimize Video Categories**:
  - Focus on high-performing categories (e.g., Technology and Fashion) and invest in producing content that aligns with audience interests.
  - Explore emerging niches or underperforming categories with high potential, using audience feedback and trends.
- **Strategic Video Publishing**:
  - Schedule video uploads on days with higher audience availability, such as Wednesdays and weekends.
  - Use audience analytics to refine publishing schedules based on peak viewership times in specific regions.
- **Leverage Thumbnails for Higher CTR**:
  - Design visually compelling and contextually relevant thumbnails to maximize click-through rates.
  - Conduct A/B testing of thumbnails to identify designs that resonate most with the target audience.
- **Ad Revenue Optimization**:
  - Improve ad placement strategies to boost monetized playbacks and impressions.
  - Experiment with different ad formats (e.g., skippable vs. non-skippable ads) to find the most effective combinations.
- **Balance Video Length**:
  - Aim for a balanced video duration (5–10 minutes) to maximize average view percentage while maintaining viewer interest.
  - Use insights from retention analysis to structure content, ensuring a strong start and engaging flow.
- **Monitor Trends and Evolve Content**:
  - Track year-over-year trends in views and engagement to adapt content strategies based on changing audience preferences.
  - Use performance dashboards regularly to assess and refine video and revenue strategies.

By embedding these recommendations into their content strategies and using the Tableau Dashboard as a decision-making tool, YouTube creators can drive higher engagement and optimize revenue generation across their video portfolios.

Exhibit A: Tableau Dashboard

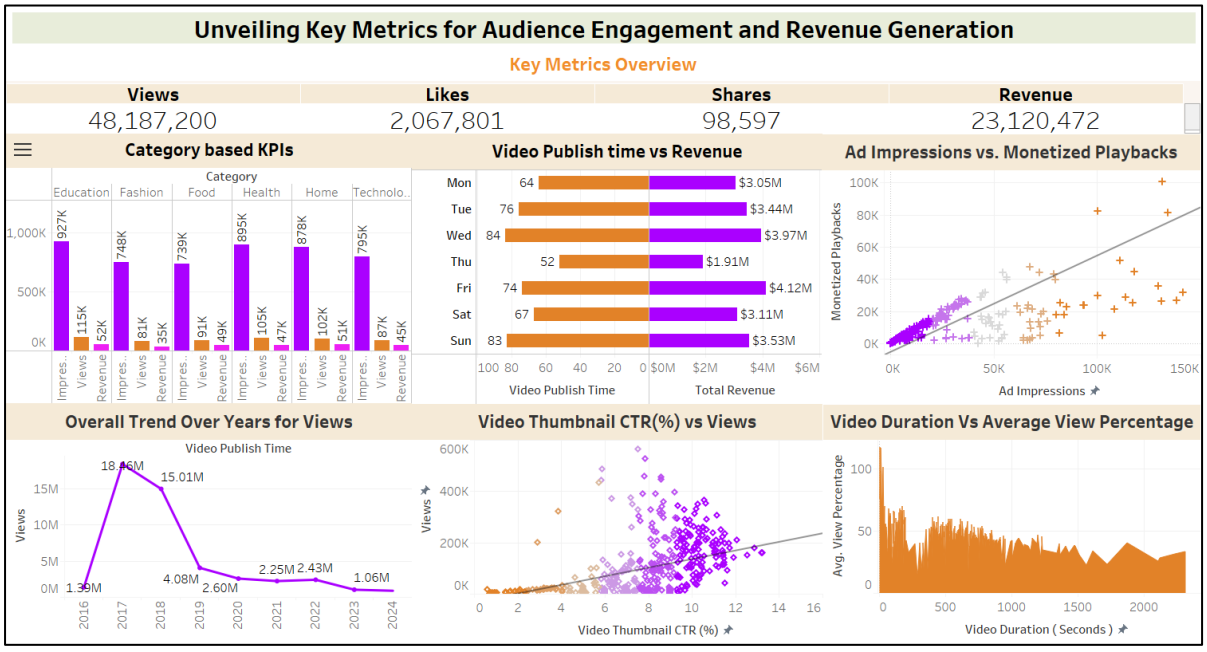


Exhibit B: Guidelines for using the Interactive Tableau Dashboard

The Tableau dashboard is fully interactive - selecting a specific category dynamically updates all graphs and metrics to display insights relevant to that category. This functionality enables users to drill down into specific areas of interest and uncover actionable strategies to enhance performance. Follow the given instructions in order to interact with the Dashboard:

1. **Selecting a Category**:
   - Use the **Category-Based KPIs graph** at the top of the dashboard as a filter.
   - Click on a category (e.g., Technology, Fashion, Food) to focus on data specific to that category.
2. **Dashboard Update**:
   - Once a category is selected, all graphs and the Key Metrics Overview table will automatically update to display data relevant to the chosen category.
   - This includes changes in trends, revenue patterns, engagement metrics, and viewer behavior for that category.
3. **Analyzing Insights**:
   - Explore how metrics like impressions, views, revenue, and engagement vary within the selected category.
   - Use these insights to understand performance patterns and identify actionable strategies for improving engagement and revenue in specific content types.
4. **Resetting the Filter**:
   - To view data for all categories again, click outside the selected category which will clear the Filter.