

The Impact of YouTube Personalization Algorithm of Content on Consumer Behavior in India

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Abstract

YouTube, one of the world's most popular online streaming social media platforms, leverages Google Brain, for personalization of its content. Powered by advanced techniques and systems founded in machine learning and artificial intelligence, the concept of personalization finds its roots in digital marketing with a primary purpose to augment online customer experience. This research work aims to comprehend and quantify the impact of personalization of YouTube on consumer usage, behavior and attitudes in the context of India, one of YouTube's largest markets worldwide. Through both digital marketing as well as technical perspectives, a thorough understanding of personalization in YouTube India's digital landscape has been developed followed by the establishment of a statistically significant impact of YouTube personalization on consumer usage and behavior in India.

Keywords: Personalization, Consumer Behavior, Human Computer Interaction

1. Introduction

The emergence of online streaming, e-commerce and social media platforms has brought about a radical shift in how customers view, interact, and engage with content today. With increasing abundance in the volume, variety, and frequency in the availability of content to customers at their fingertips, content is no longer a marketing tool but the product itself in the digital world. Developments in the fields of artificial intelligence and machine learning have led to a transformational set of marketing techniques which enable marketers to micro-segment and -target their consumers by taking into consideration not only the demographic but also their psychographic aspects to provide them with relevant and instantaneously updated content feed. Personalization is a core marketing technique successfully used in major online social platforms like YouTube, Netflix, Google, Facebook, Amazon, eBay and Instagram in order to offer an improved, more relevant online experience to consumers (Chaffey & Ellis-Chadwick, 2019).

YouTube, with over 2 billion monthly logged-in users recorded as of 2021, is second in the list of the world's most visited websites at 22.8 billion total monthly visits (YouTube, 2021; Clement, 2021). With localized content in over 100 different countries, YouTube is available in 80 different languages with 95 per cent of content consumption in regional language (Clement, 2021). In October 2020, India has become YouTube's largest market worldwide, with over 325 million unique monthly users with a growth rate of 45% since July 2020 (Warc, 2020). Besides its humongous global presence, another major aspect of YouTube is its successful levels of consumer engagement in the form of user-generated content (UGC). To understand this dynamic landscape of YouTube, which is evolving, not only in terms of its diverse users and partners, but also through its adoption of tools and technologies like personalization, it is important to understand how YouTube's users perceive these changes.

Personalization on YouTube, making use of the most state-of-the-art Artificial Intelligence system, Google Brain, is a complex machine learning phenomenon continuously optimized by substantial amounts of user data generated every passing minute. The effect of these changes on their behavioral and usage patterns and the concerns that have risen with respect to data privacy must also be addressed.

2. Putting Personalization into Perspective

Online personalization, with its highly focused insights on customer needs and consumption patterns, has become the buzzword of the digital marketing world. MIT Professor and Marketing Scientist, Sinan Aral, in his book 'The Hype Machine', describes personalized mass persuasion as a part of the trifecta that governs the New Social Age (Aral, 2020). Over 69 % of companies describe personalization of customer experience as a top priority, with 40 % viewing web personalization as an effective means to achieve their business goals (V12, 2019). Personalization leaders have observed about 5 to 15% increase in revenue and a 10 to 30% increase in marketing-spend efficiency by leveraging personalization in their marketing strategies and about 44% of CMOs predict the use of advanced analytics to personalize their customer offerings (Boudet et al., 2019).

While the cornerstone of personalization is rooted in marketing with a purpose to enhance customer experience, personalization today has evolved into a complex phenomenon

that can be examined through multifarious lens including technological, psychological as well as sociological perspectives. Some relevant definitions are summarized in the Table 1.

Table 1

Definitions of Personalization

Reference	Definition
Chaffey & Ellis-Chadwick, 2019	Digital experience personalization involves dynamic serving of customized content, products or promotional offer recommendations to website visitors or app users based on their characteristics and intent behavior to support conversion and long- term engagement goals.
Gregg et al., 2016	Personalization is the tailoring of messages or offers to individuals based on their actual behavior.
Zanker et al., 2019	Online personalization as a system that (1) makes assumptions on an individual’s goals, interests, and preferences, (2) in order to tailor interaction and content, (3) so as to provide the most relevant user experience.

While Chaffey & Ellis-Chadwick (2019) and Gregg et al. (2016) define personalization from a digital marketing perspective, Zanker et al. (2019) provide a technical insight into the functional aspects of personalization through their definition. In this research, the Zanker et al. (Zanker et al., 2019) definition was adopted as the basis for holistic exploration of the concept of personalization. Zanker et al. (2019) provide a comprehensive view on the multidisciplinary nature of the concept of personalization spanning over the fields of Artificial Intelligence (AI) and Machine Learning (ML), Human – Computer Interaction (HCI) and Information Systems (IS), and User Modelling based on (applied) social and cognitive psychology. Three major dimensions of personalization are identified as, user interface, content and interaction process (Zanker et al., 2019). In this research work, the primary focus was on content-based personalization.

Content-based personalization employs two techniques namely, collaborative filtering and deep neural networking. Collaborative filtering is used in recommendation systems to provide customized predictions for each user based on their preferences. Collaborative Filtering serves two main purposes from the customer and company’s perspectives. It drives customers to consume more of what they like by providing recommendations determined by calculations and aids with the determination of the company’s portfolio development based on the customer preferences of products (Rajkumar & Ronald, 2019). Rajkumar & Ronald (Rajkumar & Ronald, 2019) preempt that one of the major challenges to collaborative filtering is the cold start problem which stems from its high dependency on the ratings of the users. In case of incompleteness/ inadequacy of data, the effectiveness of this technique is reduced. Barring a few limitations, this technique is extensively employed by online platforms like Netflix and Amazon (Mello, 2020). Deep Neural Networking is a multi-layered set of algorithms capable of recognizing patterns in a manner comparable to the human brain. Real-world data like images, sound, text, or time series must be translated into numerical inputs contained in vectors for neural networks. Google

Brain, YouTube's recommendation system makes use of deep neural networking techniques to personalize the YouTube feed (Nicholson, 2020).

2.1. Personalization on YouTube

With an unprecedented rise in the volume of user-generated content on YouTube, the need for a system to organize the content to provide ease of access to content in accordance with user's preferences was felt by the creators of YouTube. Besides the option to subscribe to YouTube channels which allowed systematic display of content from the subscribed channels similar to other social media platforms like Facebook, there was no system in place to curate content to match the user's preferences and interests (Newton, 2017). In 2010, using a Google-built recommendation system called Sibyl, machine learning techniques were applied to provide recommendations on YouTube (Popken, 2018). In 2015, YouTube started using Google Brain as their artificial intelligence recommendation system. Google Brain was able to detect several patterns with the help of the large amounts of data it collected on user behavior. Today, it is estimated that 70 per cent of the videos watched on YouTube are because of its algorithmic recommendations as opposed to other content watched through Google/YouTube search results. With 200 million recommendations per day in 76 different languages, the time spent by people watching videos on the homepage is estimated to be 20 times what it was three years before the use of Google Brain (Newton, 2017).

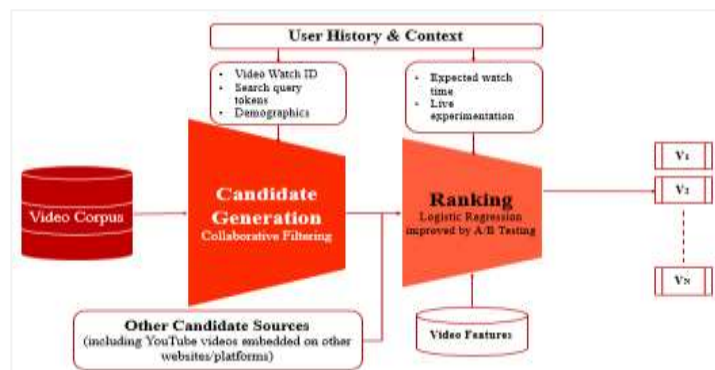
While YouTube has a clear competitive advantage over other social media platforms with respect to its viewer segment RACE (Reach, Act, Convert and Engage) strategy through recommendation systems, it needs to re-evaluate its strategies with respect to keeping a steady influx of user-generated content and encouraging new content creators to use YouTube for their content. As of 2018, 64 percent of videos recommended are those with more than a million views (Madrigal, 2018). Therefore, it would be useful to understand the strategy of content creators to tackle the YouTube recommendation algorithm.

2.2. Functioning of YouTube recommendation system

YouTube's recommendation system consists of two neural networks, one for candidate generation and the other for ranking. The architecture of YouTube's recommendation system is summarized in Figure 1.

Figure 1

YouTube Recommendation System (Covington et al., 2016)



For candidate generation, the user's watch history is utilized to train the model. It makes use of collaborative filtering using video watch ID, token search query and demographics in order to predict video selections from a vast pool of videos based on implicit and explicit feedback received from the user (Covington et al., 2016). Implicit feedback like views or subscriptions are more common as compared to explicit feedback like likes/dislikes on videos (Cho, 2020).

Further, for ranking, logistic regression is used to determine the order of videos which is then continuously improved by using A/B testing. The common metric used is expected watch time which is a far more accurate metric than clicks which could be a result of clickbait thereby being highly misleading (Cho, 2020).

3. Setting the Indian Context

3.1. Consumption patterns in India

In 2019, an average Indian adult is estimated to spend 1 hour and 29 minutes on a daily basis on digital media out of which 70 minutes is spent watching videos on smartphones – a number that is expected to steadily increase by 2021 (Han, 2019; TimesofIndia.com, 2020). These figures are higher than the global average of 41.9 minutes of YouTube daily watch time average (Newberry, 2021). The Covid-19 pandemic was predicted to result in 7.2% growth in these numbers in India (Cramer-Flood, 2020). Towards the end of 2020, the average time spent by Indians watching videos averages at 11 hours a week with YouTube as the most preferred website for user-generated content (Sheth, 2020). Entertainment-based content is most preferred by the Indian audience followed by informational content and then promotional content. Music is the most consumed type of content on YouTube by Indians (Ananya Bhattacharya, 2019). Most of the content is viewed on smartphones, especially by the younger demographic (Hootsuite, 2020). These observations are consistent with global statistics (Newberry, 2021).

With tech giants like Google and Facebook making enormous investments in major digital and telecom companies in India, this trend of high online content consumption and content creation in India can only be expected to rise (ET Bureau, 2020; ETMarkets.com, 2020). In the words of Susan Wojcicki, YouTube's CEO, "India is YouTube's largest and fastest growing market in the world" (Laghate, 2019).

3.2. YouTube in India

YouTube was launched in India in 2008, three years after its creation on 14th February, 2005 (Economic Times, 2008). Currently, YouTube has over 325 million users and 2300 channels with over a million subscribers from India making it one of the platform's largest markets (Warc, 2020). YouTube has the second largest share in the Indian social media market amounting to approximately 9 % as of July 2020 after Facebook (Keelery, 2021b). YouTube is the second most visited website in India after Google (Keelery, 2021a). T-series, an Indian channel, is the world's most-subscribed channel and most-viewed channel at 191 million subscriptions (as of September 2021) (StatistaResearchDepartment, 2021). The Indian digital landscape is contextualized in Fig. 2 with respect to YouTube's Indian audience.

As of 2021, India has the second largest number of internet users in the world after China with an estimate of 845 million monthly active users towards the end of the year from just 52 million users in 2008 (Keelery, 2021b; Economic Times, 2019; Internet Live Stats, 2019). The introduction of Reliance Jio into the Indian market in 2016 has not only proved to be disruptive in the telecom

industry, but has fundamentally revolutionized accessibility and viability of internet services throughout India (Mukherjee, 2019).

Based on the nature of content, content on YouTube can be described as Entertainment, Promotional and Informational Content (EPIC). *Entertainment* refers to music, film, television shows and related content along with skits, monologues, stand-up comedy, short films, parodies and even reaction videos to content on YouTube. It is interesting to note that 47% of the video streaming that happens on YouTube is music (Iqbal, 2020). *Promotional* content refers to adverts, marketing campaigns like online challenges and events that aim to create customer awareness about the products and services, thereby, creating customer engagement and subsequent conversion. There is a steady rise in the amount of promotional content online as observed by effective video marketing strategies adopted by businesses (Zote, 2020). *Informational* content refers to content that aims to render information in the form of news, instructional videos, educational videos, reviews, trivia, sports, and gaming hacks. According to a Pew Research Study, 51 per cent of YouTube users use YouTube for educational purposes (Aaron Smith, Skye Toor, 2018). The content can often fall into one or more categories, thereby, giving rise to hybrid content which serves multiple purposes. Entertainment-based content is most preferred by the Indian audience followed by informational content and then promotional content.

4. Research Design

Given how recent the development of personalization is, there is much left to be discovered and understood both, from technical perspectives as well as the implications it holds for the quickly expanding discipline of digital marketing. India, with its increasing digital potential in the form of a fast-growing community of netizens, forms one of the largest markets for YouTube and the digital space in general.

Through this research work, the effect of the introduction of the personalization algorithm on YouTube on consumer behavior, usage and attitudes in India have been thoroughly investigated. This research work finds its basis in the typical online customer lifecycle (**R**each, **(I**nter)**A**ct, **C**onvert and **E**ngage Strategy) and factors influencing customer behavior online to study consumer behavior and usage patterns among YouTube India users (Keelery, 2021b).

Following the determination of the objectives of study, relevant research questions and the hypothesis establishing the impact of personalization on consumer usage, behavior and attitudes were formulated. The null and alternate hypotheses, thus formulated, are as follows.

Null Hypothesis (H_0),

H_0 : YouTube personalization of content has no significant impact on consumer behavior, usage, and attitude in India.

Alternate Hypothesis (H_a),

H_a : YouTube personalization of content has a significant impact on consumer behavior, usage, and attitude in India.

This was succeeded by a comprehensive literature review. The literature review offered insights on various aspects of personalization, both from technical as well as digital marketing perspectives. It was also instrumental in developing an understanding of YouTube's largest market, India and the consumption patterns of YouTube in India. While research is extensive on the technical capabilities of personalization, the literature on the result of personalization, that is, consumer usage, attitudes, and behavior in response to personalization is limited. These research gaps were sought to be bridged through this research work.

An online questionnaire with multiple choice questions, both single and multiple response types, were accordingly used to determine consumer demographics and consumer usage patterns on YouTube India. Additionally, the 7-point Likert Scale was used to determine consumer psychographics towards the adoption of personalization on YouTube.

This was followed by preliminary analysis using Tableau resulting in the development of six dashboards: one on **Survey Metadata Analysis**, another on **Survey Consumer Demographic Analysis** (based on *age, gender* and *level of education*), three on **Consumer Usage Analysis** (based on *choice of device, type of content* and *usage time*) and finally one on **Consumer Psychographic Analysis** which measured the degree of awareness, the degree of interaction, degree of conversion, retention and engagement and privacy concerns among consumers regarding the YouTube personalization algorithm.

Using a series of statistical tests, including Cronbach Alpha's Reliability Test, GLM ANOVA and Ordinal Logistic Regression to determine the scale reliability and quantitative analysis to determine the effect of personalization on consumer demographic characteristics, consumer usage, behavior and attitudes, comprehensive quantitative analysis was conducted. All tests were conducted using SPSS software.

5. Results and Discussion

5.1. Results of quantitative analysis

Post detection of the outlier, statistical analysis was conducted on 175 values that fit the normality condition. From the results of GLM multi-factor ANOVA, it was inferred that there is no significant impact of YouTube personalization on the consumer demographic factors such as age (0.916), gender (0.617) or level of education (0.855). The results of GLM one-way ANOVA produced a statistically significant result of 0.022 (<0.05) which was produced at $M= 92.07$ and $S.D. = 16.653$. This indicates that there is a statistically significant impact of YouTube personalization on consumer usage time. The results of the ordinal logistic regression indicated a statistically significant difference of each factor with respect to privacy concerns as they all show a significance level of 0.000 (<0.05). This is indicative of the existence of a statistically significant impact of personalization on consumer behavior and attitudes. Further, using parameter estimates, the relationship between the four dependent variables was established using the factor privacy concerns as the reference value. Privacy concerns were 1.67 times more pronounced than the degree of awareness, 3.32 times the degree of interaction and 4.65 times the degree of conversion, retention and engagement.

5.2. Hypothesis Testing

Based on the results of the quantitative analysis, the null hypothesis (H_0) is rejected, and the alternate hypothesis (H_a) is accepted. It can be concluded that

YouTube personalization of content has a significant impact on consumer usage, behavior, and attitudes in India.

6. Conclusions

YouTube's growth over the past 15 years since its establishment in 2005 has been exponential both in terms of business expansion as well as technological advancements in the digital world. From digital, entertainment and technological standpoints, YouTube's evolution

into one of the most popular social media online streaming platforms has been nothing short of disruptive. Its extensive and growing digital media offerings are perceptive of current digital media market trends and needs. With multifarious content, it is interesting to note that YouTube and other social media platforms no longer remain a hub for entertainment. YouTube is increasingly becoming a popular destination for news, education, and other forms of information, especially among the younger demographics.

The Indian market, with its fast-evolving trends towards digitalization, continues to consistently display high brand engagement in terms of viewership, content consumption and content creation. With increased digitalization and foreign investment from tech giants like Google and Facebook in Reliance Jio, widespread mobile internet accessibility and connectivity are driving for the digital transformation in India.

From the literature review, the technical and industrial impacts of personalization of the YouTube content feed are prominently highlighted and well-pronounced. The YouTube recommendation system powered by Google Brain is a combination of deep neural networks and collaborative filtering techniques, which might be one of the most advanced applications of machine learning in this digital era. With ground-breaking innovations marking the field of artificial intelligence, technology is getting closer, by every wave of disruption, to mimic real-life human interactions with capabilities that stretch beyond and further to comprehend human subtext.

However, it is also equally important to acknowledge the limitations of artificial intelligence in comprehending the nuances and complexities of human exchanges reflected on YouTube itself, in the form of undue demonetization of videos and biased censorship based on keywords. On the other extreme of this issue lies unprecedented recommendations of mature content on the feeds of younger audiences.

The aim of this research was to understand how the adoption of the personalization algorithm on YouTube has affected the users of the platform – consumers. India, being one of YouTube's largest markets with enormous potential for market growth, was chosen for this research. Through extensive research and analyses, a well-rounded understanding of the impact of personalization, its digital marketing and technical capabilities has been developed from the perspective of YouTube India and its digital topography. This research work has conclusively brought to light insightful findings on consumer behavior and consumption patterns in India in the purview of YouTube personalization algorithm.

References

- Aaron Smith, Skye Toor, P. V. K. (2018). Many Turn to YouTube for Children's Content, News, How-To Lessons. *Pew Research Center*. https://www.pewresearch.org/internet/2018/11/07/many-turn-to-youtube-for-childrens-content-news-how-to-lessons/?utm_source=AdaptiveMailer&utm_medium=email&utm_campaign=11-6-18 Youtube content&org=982&lvl=100&ite=3395&lea=786973&ctr=0&par=1&trk=
- Ananya Bhattacharya. (2019). Hindi music, children's shows and comedy: What Indians watched most on YouTube in 2018. *Quartz India*. <https://qz.com/india/1527590/t-series-chuchu-tv-amit-bhadana-won-indian-youtube-in-2018/>
- Aral, S. (2020). *The Hype Machine* (1st ed.). HarperCollinsPublishers, 2020. <https://doi.org/2020>
- Ari, E., & Yildiz, Z. (2014). Parallel lines assumption in ordinal logistic regression and analysis approaches. *International Interdisciplinary Journal of Scientific Research*, 1(3), 8–23.
- Bharadwaj, A., & Mehta, R. (2017). Annihilating or perpetuating the gender stereotype? An analysis of Indian television advertisements. *Decision*, 44(3), 179–191. <https://doi.org/10.1007/s40622-017->

- Bhattacharya, A. (2018). The number of smartphone users in India will more than double in four years. *Quartz India*.
- Boudet, J., Gregg, B., Rathje, K., Stein, E., & Vollhardt, K. (2019). The future of personalization - and how to get ready for it. *McKinsey & Company, June*. <https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-future-of-personalization-and-how-to-get-ready-for-it>
- Chaffey, D., & Ellis-Chadwick, F. (2019). *Digital Marketing: Strategy, Implementation and Practice*. 7.
- Cho, H. (2020). *Collaborative Filtering in our life*.
- Clement, J. (2021). Most popular websites worldwide as of June 2021, by total visits. In *Statista*. <https://www.statista.com/statistics/1201880/most-visited-websites-worldwide/>
- Covington, P., Adams, J., & Sargin, E. (2016). Deep neural networks for youtube recommendations. *RecSys 2016 - Proceedings of the 10th ACM Conference on Recommender Systems*, 191–198. <https://doi.org/10.1145/2959100.2959190>
- Cramer-Flood, E. (2020). *India Time Spent with Media 2020*. <https://www.emarketer.com/content/india-time-spent-with-media-2020>
- Duffett, R. G. (2015). Facebook advertising's influence on intention-to-purchase amongst Millennials. *Internet Research*, 25(4), 498–526.
- Economic Times. (2008). *Youtube launched in India*.
- Economic Times. (2019). *India has second highest number of Internet users after China: Report*.
- ET Bureau. (2020). CCI okays Facebook's investment of Rs 43,574 crore in Jio Platforms. *Economic Times*. <https://economictimes.indiatimes.com/tech/internet/cci-okays-facebooks-investment-in-jio-platforms/articleshow/76561345.cms>
- ETMarkets.com. (2020). Google to invest Rs 33,737 crore for 7.73% stake in Jio Platforms. *Economic Times*. <https://economictimes.indiatimes.com/markets/stocks/news/google-to-invest-rs-33737-crore-for-7-73-stake-in-jio-platforms/articleshow/76977415.cms>
- General Linear Model. (2019). In *NCSS Statistical Software* (pp. 341–394). https://doi.org/10.1142/9789811200410_0007
- Gregg, B., Kalaoui, H., Maynes, J., & Schuler, G. (2016). *Marketing 's Holy Grail: Digital personalization at scale*. 1–5.
- Han, J. (2019). *Time spent with Media 2019 - India*.
- Hootsuite. (2020). *More Than Half of the People on Earth Now Use Social Media*. <https://blog.hootsuite.com/simon-kemp-social-media/#:~:text=August 10%2C 2020-,The new Digital 2020 July Global Statshot report from Hootsuite,51%25 of the global population.>
- Internet Live Stats. (2019). *TOP 20 COUNTRIES WITH THE HIGHEST NUMBER OF INTERNET USERS*. Internet Live Stats. <https://www.internetworldstats.com/top20.htm>
- Iqbal, M. (2020). *YouTube Revenue and Usage Statistics (2020)*. <https://www.businessofapps.com/data/youtube-statistics/>
- Keelery, S. (2021a). *Leading websites in India 2020, by traffic*. <https://www.statista.com/statistics/1108779/india-websites-ranking-by-traffic/>
- Keelery, S. (2021b). *Number of internet users in India 2010-2040*. <https://www.statista.com/statistics/255146/number-of-internet-users-in-india/>
- Laghate, G. (2019). India is YouTube's largest and fastest growing audience in the world: CEO. *Economic Times*. <https://economictimes.indiatimes.com/industry/media/entertainment/india-is-youtubes-largest-and-fastest-growing-audience-in-the-world-ceo/articleshow/68798915.cms?from=mdr>
- Madrigal, A. C. (2018). *How YouTube's Algorithm Really Works*.
- Mello, A. (2020). *How do Netflix and Amazon know what I want?* <https://towardsdatascience.com/how-do-netflix-and-amazon-know-what-i-want-852c480b67ac>
- Mukherjee, R. (2019). Jio sparks Disruption 2.0: infrastructural imaginaries and platform ecosystems in 'Digital India.' *Sage Journals*, 41(2), 175–195.

- Nagarajan, R. (2020). Male or female, urban or rural, over 50% Indians 25 years or older. *Times of India*. <https://timesofindia.indiatimes.com/india/male-or-female-urban-or-rural-over-50-indians-25-yr-or-older/articleshow/76759847.cms>
- Newberry, C. (2021). *25 YouTube Statistics that May Surprise You: 2021 Edition*. <https://blog.hootsuite.com/youtube-stats-marketers/>
- Newton, C. (2017). *How YouTube Perfected the Feed*.
- Nicholson, C. (2020). *A Beginner's Guide to Neural Networks and Deep Learning*. <https://pathmind.com/wiki/neural-network>
- Norris, C. M., Ghali, W. A., Saunders, L. D., Brant, R., Galbraith, D., Faris, P., & Knudtson, M. L. (2006). Ordinal regression model and the linear regression model were superior to the logistic regression models. *Journal of Clinical Epidemiology*, 59(5), 448–456. <https://doi.org/10.1016/j.jclinepi.2005.09.007>
- Page, M. C., Braver, S. L., & Mackinnon, D. P. (2003). *Levine's Guide to SPSS for Analysis of Variance* (Issue 1). <https://doi.org/10.16309/j.cnki.issn.1007-1776.2003.03.004>
- Popken, B. (2018). As algorithms take over, YouTube's recommendations highlight a human problem. *NBC News*. <https://www.nbcnews.com/tech/social-media/algorithms-take-over-youtube-s-recommendations-highlight-human-problem-n867596>
- Rajkumar, V., & Ronald, T. (2019). *Collaborative Filtering Gives Customers What They Want*.
- S., R. (2015). Only 8.15% of Indians are graduates, Census data show. *The Hindu*. <https://www.thehindu.com/news/national/only-815-of-indians-are-graduates-census-data-show/article7496655.ece>
- Sheth, H. (2020, November 5). Indians spend nearly 11 hours per week on video streaming: Report. *BusinessLine, The Hindu*. <https://www.thehindubusinessline.com/news/indians-spend-nearly-11-hours-per-week-on-video-streaming-report/article33027753.ece>
- StatistaResearchDepartment. (2021). *Most popular YouTube channels as of August 2021, ranked by number of subscribers*. <https://www.statista.com/statistics/277758/most-popular-youtube-channels-ranked-by-subscribers/>
- TimesofIndia.com. (2020). Smartphone users in India on an average spend 70 minutes per day watching videos: Report. *Times of India*. <https://timesofindia.indiatimes.com/gadgets-news/smartphone-users-in-india-on-an-average-spend-70-minutes-per-day-watching-videos-report/articleshow/74339253.cms>
- V12. (2019). *69% of Companies Rate Personalizing the Customer Experience as Top in Priority*. <https://v12data.com/blog/69-companies-rate-personalizing-customer-experience-top-priority/>
- von Eye, A., & Wiedermann, W. (2015). General linear models for the analysis of single subject data and for the comparison of individuals. *Journal for Person-Oriented Research*, 1(1–2), 56–71. <https://doi.org/10.17505/jpor.2015.07>
- Walker, E. (2003). Regression Modeling Strategies. *Technometrics*, 45(2), 170–170. <https://doi.org/10.1198/tech.2003.s158>
- Warc. (2020). *YouTube India now reaches 325 million monthly viewers*. <https://www.warc.com/newsandopinion/news/youtube-india-now-reaches-325-million-monthly-viewers/44286>
- YouTube. (2021). *YouTube by the Numbers*. <https://blog.youtube/press/>
- Zanker, M., Rook, L., & Jannach, D. (2019). International Journal of Human-Computer Studies Measuring the impact of online personalisation: Past, present and future. *Journal of Human Computer Studies*, January, 0–1. <https://doi.org/10.1016/j.ijhcs.2019.06.006>
- Zote, J. (2020). *40 YouTube stats and facts to power your 2020 marketing strategy*. <https://sproutsocial.com/insights/youtube-stats/>