Trend Analysis of the Social Media in India: A Statistical Study

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Abstract

As a medium for social networking and content exchange, social media has become more significant and widely accepted in recent years. The specifics of social media usage have been taken into account. The general public is using the Internet much more frequently these days. Using social media sites like Facebook, WhatsApp, Linked In, Instagram, and many other social media platforms negatively impacts their productivity in the long run and has a substantial influence on both social and personal connections. In this article an estimate of the trend of social media platforms till 2030.

Keywords: Social Media, Least-square Method, R-Programming, χ^2 -test.

Introduction:

Social media (SM) is a very popular term these days. SM creates a virtual community by using the internet. SM has become a very important part of our lifestyle. It differs from other media such as electronic media, print media and parallel media. It is a virtual platform that allows a user to create a public profile and interact with other users on the website. Profiles are used to share your thoughts and talk to familiar or strangers. In 1997, the first social media network in history was introduced. Six Degree was its name. The founder of this platform is Andrew Weinrich. Its user base exceeded one million in 2001. [1]

By 2023, 74.70% of internet users in India will be using Instagram as their primary social media platform. The current Instagram user count is 516.92 million. Youth, particularly teens, make up a sizable portion of Instagram's user base. Facebook ranks second in popularity among internet users in India, where 71.20% of users have profiles on the social network, with 492.70 million active users. Some other popular social networking sites in India are X (Twitter), LinkedIn (35.7%), Moj (29.50%), a locally produced short video community, and Pinterest (29%) for example. Among the few recent rivals is a brief video software called Moj Lite Plus (26.20%).[2]

With 531.46 active users, WhatsApp is the most popular chat app in India. 76.80% of all internet users in the country use WhatsApp, which is owned by Meta. With 384.06 million users, Telegram is the second most popular app on the list and has a penetration rate of 55.5%. The third app is Facebook Messenger (343.92 million users), which holds 49.70% of the teen market. Snapchat ranks fourth in the list of social media chat apps for 2023 with 45.50% subscribers.[2]

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Review of literature:

Nalwa K. and anand A.P. (2003) [3]this article describes internet addiction especially teenagers by using basic statistical tools. **Asur S. and Huberman B.** (2010) [4] in this paper a simple model built from the rate at which tweets are created about particular topics can outperform market-based predictors also an demonstration is to improve the forecasting power of social media. **Al-Rahmi, W.** (2013) [5]The main objective of this paper was to study how social media affects the academic performance of university students, as well as the advantages and disadvantages of social media. **Obar J. & Wildman S.** (2015)[6]this article define the term social media and studied about different definition of social media as well as administration challenge. **Hashem Y.** (2015)[7] in this paper, we study how the use of different social media platforms affects kids' academic performance and is essential in the modern world. **Akram W. and Kumar R.**(2017)[8] this paper describes the pros and cons of social media in our society. The main focus is on health, business, society, education and youth. **Harchekar J. S.** (2017)[9] in this note, we study the role of social media in our society and also study how it affects our lives. **Kumarasamy T. and Srinivasan J.**(2017)[10] in this article, we studied the role of social media on small and medium business entrepreneurs. Also studied the pros and cons of social media on small and medium business entrepreneurs as well as motivation to use of social media platform. **Karim F. et al.** (2020)[11] in this paper anxiety and depression were categorized as two mental health outcomes. there are significant disparities because of the cross-sectional design and sampling's methodological restrictions. It is necessary to do more qualitative research and vertical cohort studies to further analyze the structure of social media influences on mental health. **Ansari J. A. N. and Khan N. A.** (2020)[12] This study is based on the application and usefulness of social media in education's considerable effect on online knowledge-sharing behavior, peer and teacher interaction, and mental health domain. **Chen M. and Xiao X.** (2022)[13] this paper shows the role of different social media platforms in education after the post-pandemic. Basically, this paper studied the results of the best research studies that have been released to illuminate the possible impacts of widespread social media use on students' mental wellbeing, both good and bad. **Ajijola S.** (2023)[14] this paper describes the importance of social media in our society and the positive and negative effect of social media. The functions identified in this study have demonstrated just how big of an impact social media has had on societal progress.

Objectives of the Study:

- To estimate of trend of social media platforms
- To check the goodness of fit
- To forecast social media users till 2030

Research Methodology:

1. Secondary data were collected from the different social media reports, various magazines and newspaper.

Table 1: No. of Social Media Users

Year	No. of social media users (In millions) (y)
2014	106.00
2015	142.23
2016	168.1

2017	197.85
2018	269.62
2019	395.87
2020	518.92
2021	639.47
2022	755.47
Source: Global Web Index, Pew Research, Wikipedia, Social media platforms & Kepio's Analysis	

2. **Scatter plot:** A two-dimensional graph with individual data points represented as dots or markers is called a scatter plot. It aids in the visualization of patterns, trends, and correlations in the data and is used to depict the relationship between two variables.
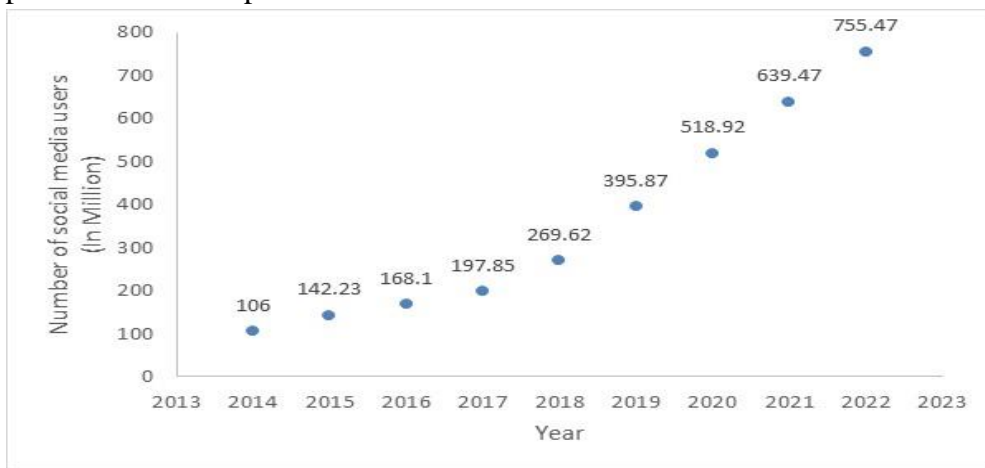
Figure 1: Scatter plot

3. least square method

Fitting of Second Degree (Parabolic) Trend:

Consider the second-degree parabolic trend curve given as:

$$y = p + qx + rx^2$$

where,

p, q, and **r** are constants. In particularly **p** is intercept coefficient and **q** and **r** are slope coefficient. **y** represents the dependent variable (users) and **x** represent the independent variable (year).

By using the principal of Least square method consists in minimizing the error sum of square. We find the normal equation to calculate the value of constants (a, b, c).

$$\sum y = n*p + q \sum x + r \sum x^2$$
$$\sum xy = p \sum x + q \sum x^2 + r \sum x^3$$
$$\sum x^2 y = p \sum x^2 + q \sum x^3 + r \sum x^4$$

R-code:

```
# Create a dataset
year <- c(2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)
users <- c(106, 142.23, 168.1, 197.85, 269.62, 395.87, 518.92, 639.47, 755.47)
# Fit a second-degree polynomial
model <- lm(users ~ poly(year, 2, raw = TRUE))
# Coefficients of the model
```

```
coefficients <- coef(model)
# Extract coefficients for the polynomial equation
p <- coefficients[1]
q <- coefficients[2]
r <- coefficients[3]
# Define a function for the polynomial equation
polynomial_equation <- function(x) {
  return(p + q * x + r * x^2)
}
# Create a dataset for future years (up to 2030)
future_years <- data.frame(year = 2014:2030)
# Predict values using the model
predicted_values <- polynomial_equation(future_years$year)
# Combine years and predicted values
future_data <- data.frame(year = 2014:2030, users = predicted_values)
# Print the trend equation
trend_equation <- paste("Trend Equation: y =", round(p, 2), "+", round(q, 2), "* x +", round(r, 2), "*
x^2")
cat(trend_equation, "\n")
# Create a plot
plot(year, users, type = "o", col = "blue", ylim = c(0, 900), xlab = "Year", ylab = "Number of Users",
main = "Social Media Users Trend")
# Add points for the predicted data
points(future_data$year, future_data$users, type = "o", col = "red")
# Add data labels for the original data points
text(year, users, labels = users, pos = 3, col = "blue")
# Add data labels for the predicted data points
text(future_data$year, future_data$users, labels = round(future_data$users, 2), pos = 3, col = "red")
# Add a legend
legend("topright", legend = c("Original Data", "Fitted Trend"), col = c("blue", "red"), lty = 1)
# Get the summary of the model
model_summary <- summary(model)
# Print the model summary
print(model_summary)
# Print the trend values for future years
print(future_data)
```

Output of R-code:

Trend Equation:

$$y = 37784695.88 - 37530.53*x + 9.32*x^2$$

$$R\text{-squared} = 0.9946$$
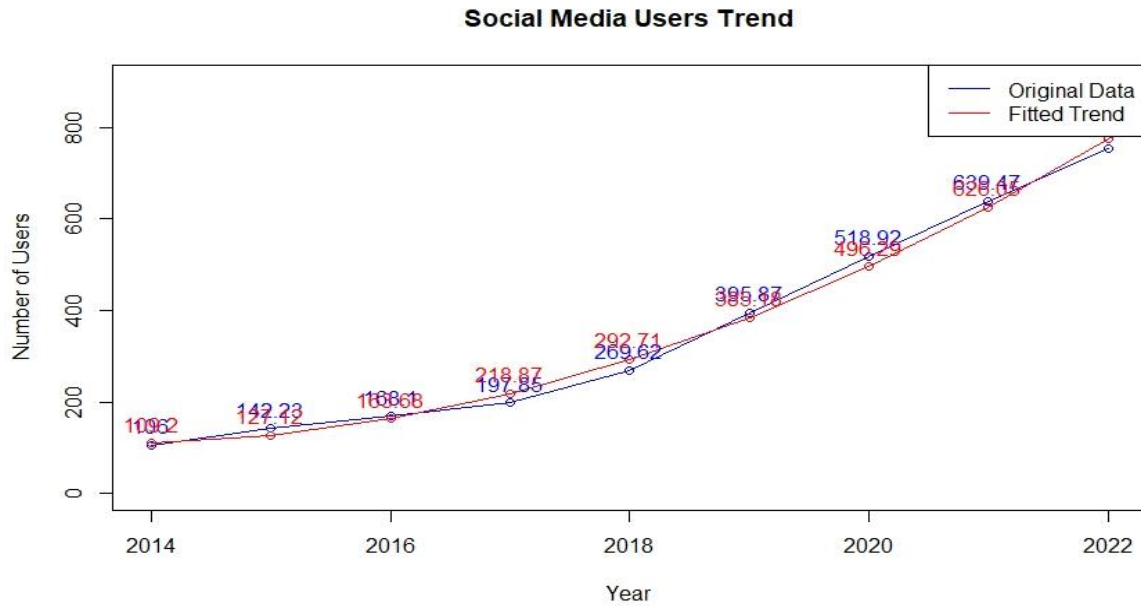
Figure 2: Social Media Users

Table 2: Increment Ratio and Expected trend values

Year	Number of social media users (In millions) (y)	Increment Ratio (in %)	Expected (Trend) Values (In millions)
2014	106	34.18	109.2018
2015	142.23	18.19	127.1193
2016	168.1	17.70	163.6759
2017	197.85	36.27	218.8716
2018	269.62	46.83	292.7064
2019	395.87	31.08	385.1802
2020	518.92	23.23	496.2932
2021	639.47	18.14	626.0453
2022	755.47	-	774.4364

Forecast up to 2030:

Table 3: Forecast Social Media Users

Year	Forecast values (in millions)
2023	941.4667
2024	1127.136
2025	1331.444
2026	1554.392
2027	1795.979
2028	2056.204
2029	2335.069
2030	2632.573

4. Goodness of fit:

a) **Null Hypothesis (H_o):** There is no difference between observed and expected values.

Alternative Hypothesis (H_a): There is difference between observed and expected values.

Chi-square test statistic:

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} \sim \chi^2_{(n-1)}$$

Table 4: Chi-Square statistic

Year	Number of social media users (In millions)(O_i)	Trend users (In Millions) (E_i)	$(O_i-E_i)^2$	$\dfrac{(O_i - E_i)^2}{E_i}$
2014	106	109.2018	10.25125	0.093874
2015	142.23	127.1193	228.3341	1.796219
2016	168.1	163.6759	19.57285	0.119583
2017	197.85	218.8716	441.9067	2.019023
2018	269.62	292.7064	532.9802	1.82087
2019	395.87	385.1802	114.2709	0.296669
2020	518.92	496.2932	511.9715	1.031591
2021	639.47	626.0453	180.2233	0.287876
2022	755.47	774.4364	359.7252	0.464499
Total				**7.930204**

Calculated χ^2 = **7.930**

The χ^2 critical value at 5% of significance level and 8 degree of freedom is **15.507**.

b) Decision criteria: $\chi^2_{calculated} < \chi^2_{tabulated}$, We fail to reject the null hypothesis otherwise we do not reject the null hypothesis.

5. Conclusion:

According to the analysis we see that in the year 2017, the increment ratio of social media users increased (36.27%) which was the highest in 2018 (46.83%) reason behind that was the launching of the 4G network. After that increment ratio continuously decreases. In the present scenario, various social media platforms (Facebook, WhatsApp, Linked In, Instagram, etc.) users are increasing rapidly with a **decrees** ratio.

This study confirms that the above statement is true and the number of users for all social media platforms increases(Table 3) yearly. A second-degree parabola is fitted for the prediction (Forecast) of social media users and the model is tested by χ^2 goodness of fit test. The model is of best fit for predictions. From the calculations and tests performed above, it's concluded that the no. of social media users has increased rapidly over time.

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