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Research Article

The Correlation between World Happiness Index and Active Social Media Users: A Decade-long Analysis

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Abstract— This study investigates the relationship between the World Happiness Index and the no. of active social media users over a ten-year period from 2014 to 2023. The data reveals an intriguing trend: as the no. of active social media users increases, the World Happiness Index fluctuates, generally showing a decline until a recent slight recovery. This research paper aims to analyze these trends, explore potential causes, and discuss the broader implications on societal well-being.

Keywords— World Happiness Index, Happiness Trends, Digital Engagement, Societal Well-being, Mental Health, Psychological Effects, Digital Age.

1. Introduction

The digital age has significantly transformed social interactions, predominantly through the proliferation of social media platforms. While these platforms offer connectivity and information sharing, their impact on societal well-being remains a topic of extensive debate. This study delves into the correlation between the World Happiness Index and the number of active social media users from 2014 to 2023, providing insights into how increased digital engagement may influence happiness levels across populations.

Figure 1: Social Media Communication

The World Happiness Index is a thorough international metric that assesses and ranks nations according to the general happiness and well-being of their populations. This index, which was started by the UN Sustainable Development Solutions Network, is an essential resource for comprehending human happiness in a larger context that goes beyond conventional economic measures like GDP.

The index, which was first presented in the 2012 World Happiness Report, is based on information gathered from surveys and analysis in a variety of fields. Happiness is measured using six primary criteria: income, life expectancy, social support, freedom of choice, generosity, and perception of corruption. The index seeks to present a comprehensive picture of societal advancements and difficulties by taking into account these multifaceted factors.

The World Happiness Index's significance stems from its capacity to draw attention to the interactions among social values, policy choices, and personal fulfillment. It acts as a standard by which governments, institutions, and scholars may pinpoint regions in need of development, create better regulations, and encourage behaviors that improve everyone's quality of life.

2. Related Work

Literature Review

Child and Adolescent Well-Being: Global Patterns (2024) examines the importance of education, social inclusion, and

economic inequality in determining happiness patterns among children and adolescents worldwide. According to the report, growing mental health issues are to blame for a 15% drop in life satisfaction levels among young people in high-income nations after 2019. Scores did, however, rise in low-income areas where educational opportunities increased.

The 2023 World Happiness Index highlights key elements such GDP per capita, life expectancy, social support, freedom, and corruption in a number of nations. Statistical modelling shows that subjective well-being consistently correlates with these traits across a range of socioeconomic situations. Scandinavian nations, for example, are frequently ranked first because of their robust social safety nets and egalitarianism. New trends highlight the changing nature of well-being dynamics by showing that, in some areas, the happiness gap between younger and older generations is closing.

Economic Growth and Happiness Paradox (2021): The study examines the relationship between economic growth and subjective well-being, questioning the "more money equals more happiness" assumption. Data from 100+ countries show diminishing returns of GDP growth on happiness beyond $15,000 per capita. High-income countries exhibit no significant increase in happiness with further economic development.

Impact of COVID-19 on Happiness Trends: The impact of the pandemic on happiness worldwide is examined in this essay, with a particular focus on social support and mental health. According to 2020–2022 surveys, life happiness has decreased by 20% worldwide, with notable differences across all safety nets reporting lesser declines. Multivariate models emphasize how community and social support can be protective.

Previous research presents mixed findings on the impact of social media on happiness. Some studies suggest that social media use enhances social connections and access to information, potentially boosting happiness (Ellison, Steinfield, & Lampe, 2007). Conversely, others highlight negative effects, such as increased anxiety, depression, and social comparison, which can diminish overall happiness (Twenge, 2019; Kross et al., 2013).

Objectives of the Study

1. Analyze Trends: To examine the trends in the World Happiness Index and the number of active social media users from 2014 to 2023.
2. Identify Correlation: To identify and analyze the correlation between the increasing number of active social media users and changes in the World Happiness Index.
3. Evaluate Impact: To evaluate the potential impacts of social media usage on societal well-being and happiness levels.
4. Explore Causes: To explore possible causes for the observed fluctuations in the World Happiness Index in relation to social media use.
5. Discuss Implications: To discuss the broader implications of social media engagement on mental health and overall societal happiness.
6.Provide Recommendations: To offer recommendations for future research and potential policy interventions to mitigate negative impacts of social media on happiness.

3. Theory/Calculation

This study utilizes data from the World Happiness Report and statistics on active social media users. The World Happiness Index, a measure that evaluates subjective well-being across various nations, serves as the primary indicator of happiness. The number of active social media users, measured in millions, is analyzed in conjunction with happiness data to identify potential correlations and trends over the specified period. Table 1 show that World Happiness Ranking, Index, and Active Social Media Users during 2014 to 2023.

Table 1: World Happiness Ranking, Index, and Active Social Media Users (2014-2023)

Year	World Happiness Ranking	World Happiness Index	Active Social Media Users (in millions)
2014	111	4.772	109.202
2015	117	4.565	127.119
2016	118	4.404	163.676
2017	122	4.315	218.872
2018	133	4.19	292.706
2019	140	4.015	385.18
2020	144	3.573	496.293
2021	139	3.819	626.045
2022	136	3.777	774.436
2023	126	4.036	941.467

4. Results and Discussion

Pearson's product-moment correlation:
H_0:correlation is equal to 0.
H_1:correlation is not equal to 0.
t = -3.0755, df = 8, p-value = 0.01522
95 percent confidence interval: (-0.9331997, -0.1983544)
correlation: -0.7360554
Conclusion: p-value < α =0.05, Thus, we reject the null hypothesis.
Call: lm(formula = happiness_index ~ social_media_users, data = data)
Residuals:

Table 2: Statistics

Min	Q1	Median	Q3	Max
-0.4945	-0.1114	-0.0212	0.11335	0.39368

Coefficients:

" Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.5415476 0.1540699 29.477 1.9e-09
social_media_users -0.0009551 0.0003106 -3.076 0.0152
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 0.2692 on 8 degrees of freedom

Multiple R-squared: 0.7418, Adjusted R-squared: 0.7095
F-statistic: 9.459 on 1 and 8 DF, p-value: 0.01522"

Granger causality test
It is evident from Graphs 1 and 2 that there is a trend in both time series. There is a negative trend in Graph 1 and a positive trend in Graph 2.

Augmented Dickey-Fuller (ADF) Test:
We test null and alternative hypothesis at α=0.05 level of significance:
H_o : The time series data is non-stationary.
H_1 : The time series data is stationary.

Table 3: Result

	ADF	Lag order	p-value
World Happiness Index	-5.249	2	0.01
Active Social Media Users	2.4384	2	0.99

In case of World Happiness Index,
The null hypothesis is rejected. Therefore, it can be concluded that the series is stationary.

In case of Active Social Media Users,
" We fail to reject the null hypothesis. Therefore, it can be concluded that the series is non-stationary."

ADF test for second difference:
Dickey-Fuller = -4.2381, Lag order = 1, p-value = 0.01495

Now we see that
The null hypothesis is rejected. Therefore, it can be concluded that the series is stationary.

Granger causality test
Model 1: social_media_users ~ Lags(social_media_users, 1:1) + Lags(happiness_index, 1:1)
Model 2: social_media_users ~ Lags(social_media_users, 1:1)
Res.DfDfF Pr(>F)
1 6
2 7 -1 9.8982 0.01991 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Social Media Users Granger-Cause World Happiness Index

Null Hypothesis Social media users do not Granger-cause the world happiness index.

Result: $F = 1.4724$

Interpretation: Since the is not statistically significant, we fail to reject the null hypothesis. This means there is no evidence to suggest that social media users Granger-cause the world happiness index.

World Happiness Index Granger-Causes Social Media Users

Null Hypothesis The world happiness index does not Granger-cause social media users.

Result: $F = 0.3618$

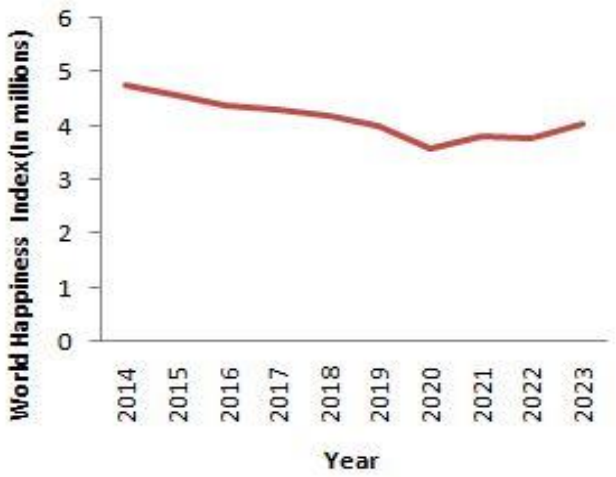
Interpretation: Similarly, the is not statistically significant. Thus, we fail to reject the null hypothesis, indicating **no evidence** that the world happiness index Granger-causes social media users.

Table 4: Statistics

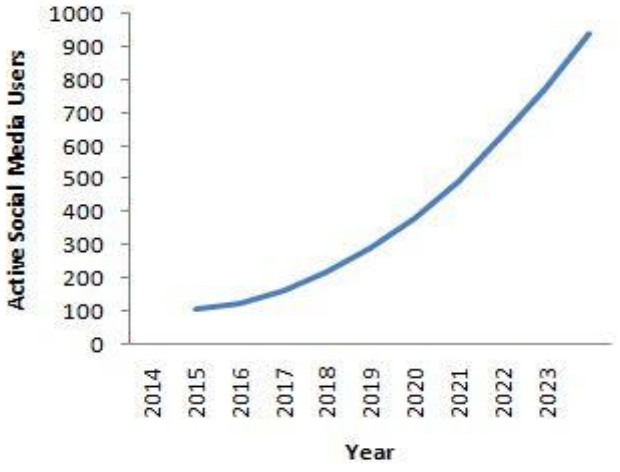
Year		Happiness index	Social media users
2104	Min.	3.573	109.2
2016	Q1	3.868	177.5
2018	Median	4.113	338.9
	Mean	4.147	413.5
2021	Q3	4.382	593.6
2023	Max.	4.772	941.5

Welch Two Sample t-test:
The null and alternative hypothesis:
The difference in means is equal to 0.
The difference in means is not equal to 0.

Results:
$t = 4.4802$, $Degree\ of\ freedom = 9$
p-value = 0.001532
95% Confidence Interval for the difference in means: $(-616.044$
Mean of x (World Happiness Index): 4.1466
Mean of y (Active Social Media Users): 413.4996

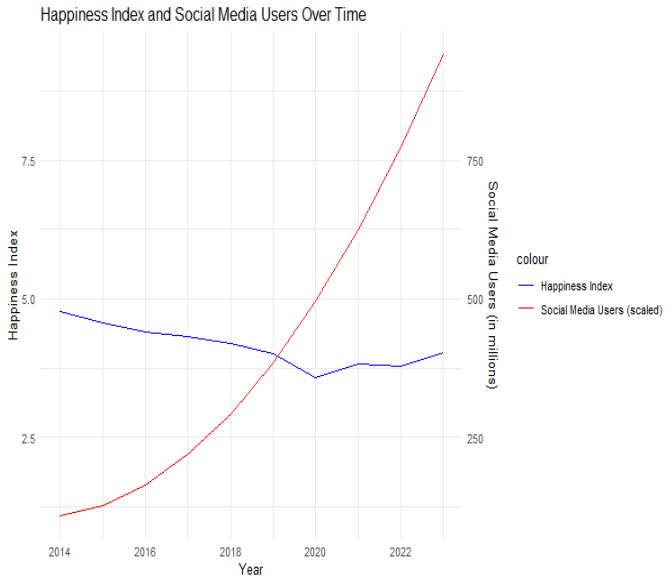


Graph 1: World Happiness Index



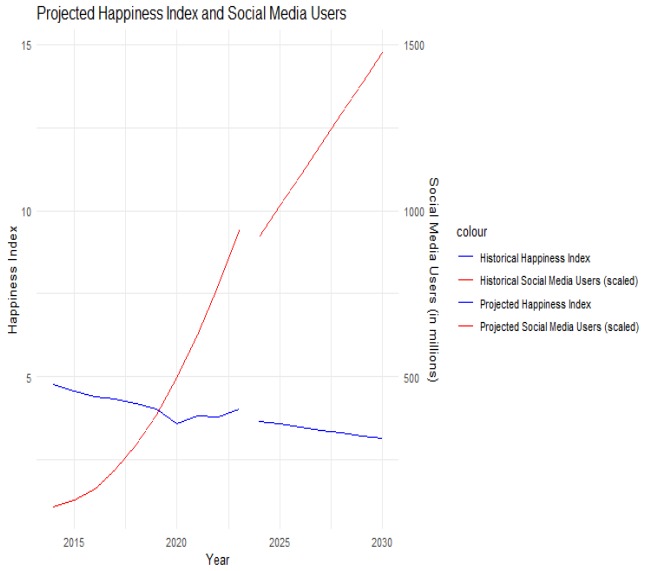
Graph 2: Active Social Media Users

The graph 1 represents the World Happiness Index (in millions) over the years 2014 to 2023. The graph 2 depicts the number of active social media users (in millions) from 2014 to 2023, showing a sharp exponential growth over the years.



Graph 3: Happiness index and Social Media Users

The relationship between the number of social media users (red line, scaled) and the Happiness Index (blue line) between 2014 and 2022 is depicted in graph 3. The number of people using social media has grown steadily and exponentially over time, from about 250 million to almost 750 million. On the other hand, the Happiness Index shows a different pattern, declining slightly between 2014 and 2018 before stabilizing but remaining unimpressive.



Graph 4: Projected Happiness index and Social Media Users

The graph 4 shows the Happiness Index and social media users' historical and anticipated changes between 2015 and 2030. The number of people using social media is predicted to keep increasing at an exponential rate, possibly reaching 1.5 billion by 2030.

It is anticipated that the Happiness Index would either hardly change or slightly decrease, suggesting that the rise of social media by itself is unlikely to raise happiness levels globally unless other underlying causes are addressed.

6. Conclusion and Future Scope

$p - value < \alpha = 0.05$, Therefore, we deny the null hypothesis. We draw the conclusion that the World Happiness Index and Active Social Media Users mean different things in a statistically significant way. The averages of the two variables—the World Happiness Index and Active Social Media Users—differ greatly. However, because the two variables have different scales and contexts, this conclusion does not imply causation or any significant relationship between them. A more thorough investigation would be required to fully comprehend their relationship.

Future research can extend the analysis over a longer time frame to determine whether the observed trends persist. Studying different demographic groups will provide insights into how social media impacts happiness across various populations. Experimental studies can help establish causal relationships, while behavioral analysis can explore the effects of different types of social media engagement. Additionally, policy recommendations can be developed to promote digital well-being and responsible social media use. With emerging technologies like AI-driven content and virtual reality, future studies should examine their potential effects on societal happiness and mental well-being.

Discussion

The increase in social media users correlates with an initial decline in happiness levels, followed by a partial recovery. This pattern may indicate that while social media provides benefits in terms of connectivity, excessive use or the nature of engagement could contribute to decreased happiness. The slight improvement in recent years could reflect adaptation to digital environments or changes in how social media is used.
These findings highlight the complex nature of social media's impact on well-being. While digital connectivity provides benefits, excessive use may contribute to mental health issues such as anxiety and social comparison, leading to lower happiness levels. However, the recent stabilization suggests that users may be modifying their online behaviors or that other societal factors are influencing happiness. Future research should explore these interactions in more detail, considering behavioral and psychological aspects, policy interventions, and the role of emerging digital trends in shaping societal well-being.

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Authors' Contributions
Sintu Nitharwal contributed to the conceptualization of the research, data collection, statistical analysis, and

interpretation of results. He also played a key role in drafting and revising the manuscript.

Dr. Deepa Mordia supervised the research process, guided the methodological framework, and provided critical insights into the interpretation of findings. She also reviewed and edited the manuscript to enhance its academic quality and clarity.
Both authors have read and approved the final manuscript.

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Appendix

R-Code

```
#Load necessary libraries
library(ggplot2)
library(tseries)
library(lmtest)
library(vars)
# Data
years <- 2014:2023
happiness_index <- c(4.772, 4.565, 4.404, 4.315, 4.19, 4.015, 3.573, 3.819, 3.777, 4.036)
social_media_users <- c(109.2018, 127.1193, 163.6759, 218.8716, 292.7064, 385.1802, 496.2932, 626.0453, 774.4364, 941.4667)
# Create a data frame
data <- data.frame(years, happiness_index, social_media_users)
# Trend Analysis: Time Series Analysis
# Plot the data
ggplot(data, aes(x = years)) +
 geom_line(aes(y = happiness_index, color = "Happiness Index")) +
 geom_line(aes(y = social_media_users / 100, color = "Social Media Users (scaled)")) +
 scale_y_continuous(sec.axis = sec_axis(~.*100, name = "Social Media Users (in millions)")) +
 labs(y = "Happiness Index", x = "Year", title = "Happiness Index and Social Media Users Over Time") +
 scale_color_manual(values = c("Happiness Index" = "blue", "Social Media Users (scaled)" = "red")) +
 theme_minimal()
# Correlation Analysis: Pearson Correlation Coefficient
cor_test <- cor.test(data$happiness_index,
```



```
data$social_media_users)
print(cor_test)
# Impact Evaluation: Regression Analysis
reg_model <- lm(happiness_index ~ social_media_users, data = data)
summary(reg_model)
# Causal Exploration: Granger Causality Test
data_ts <- ts(data[, -1], start = 2014, frequency = 1)
granger_test <- grangertest(happiness_index ~ social_media_users, order = 1, data = data_ts)
print(granger_test)
granger_test_reverse <- grangertest(social_media_users ~ happiness_index, order = 1, data = data_ts)
print(granger_test_reverse)
# Implication Discussion: Comparative Analysis
# Summary statistics
summary(data)
# Hypothesis testing: T-test between early and late years
early_years <- data[data$years <= 2018, ]
late_years <- data[data$years > 2018, ]
t_test_result <- t.test(early_years$happiness_index, late_years$happiness_index)
print(t_test_result)
# Recommendation Formulation: Scenario Analysis
# Scenario: Linear projection of social media users
future_years <- 2024:2030
projected_social_media_users <- predict(lm(social_media_users ~ years, data = data), newdata = data.frame(years = future_years))
# Projected impact on happiness index (using regression model)
projected_happiness_index <- predict(reg_model, newdata = data.frame(social_media_users = projected_social_media_users))
# Combine projections into a data frame
future_data <- data.frame(years = future_years, projected_social_media_users, projected_happiness_index)
# Plot future scenarios
ggplot() +
  geom_line(data = data, aes(x = years, y = happiness_index, color = "Historical Happiness Index")) +
  geom_line(data = future_data, aes(x = years, y = projected_happiness_index, color = "Projected Happiness Index")) +
  geom_line(data = data, aes(x = years, y = social_media_users / 100, color = "Historical Social Media Users (scaled)")) +
  geom_line(data = future_data, aes(x = years, y = projected_social_media_users / 100, color = "Projected Social Media Users (scaled)")) +
  scale_y_continuous(sec.axis = sec_axis(~.*100, name = "Social Media Users (in millions)")) +
  labs(y = "Happiness Index", x = "Year", title = "Projected Happiness Index and Social Media Users") +
  scale_color_manual(values = c("Historical Happiness Index" = "blue", "Projected Happiness Index" = "blue", "Historical Social Media Users (scaled)" = "red", "Projected Social Media Users (scaled)" = "red")) +
  theme_minimal()
```

AUTHORS PROFILE

Sintu Nitharwal earned a B.Sc. and M.Sc. from University of Rajasthan, Jaipur in 2017and 2019. Currently pursuing a Ph.D. with a specialization in Statistics Department of Statistics From University of Rajasthan, Jaipur. He is a member of ISROSET since 2024. He has published more than 4 research papers in reputed international journals and Conferences.

Dr. Deepa Mordia earned a B.Sc., M.Sc. and Ph.D. from University of Rajasthan, Jaipur in 2001, 2003 and 2018. She is currently working as Assistant Professor in Department of Statistics Science from University of Rajasthan, Jaipur since 2018. She has 18 years of teaching experience and 12 years of research experience. The earlier jobs involved teaching the Under Graduate and Post Graduate students of the Management Branch(MBA,BBA), Computer Science, Electronics, Mechanical, civil, Computer Application and Post graduate students of Bio- informatics and M.Tech. She has published more than 50 research papers in reputed international journals and Conferences.

