

Northeastern University  
Mechanical and Industrial Engineering Department

**Comparative Analysis of Digital Marketing Effectiveness: A Focus on  
Instagram vs. Alternative Platforms**



**GROUP 5**

<b>Team members</b>	<b>NU ID</b>
Vinyas Naidu Karri	002485274
Nayana Magadi Nagaraj	002430481

## Table Of Content

Sl. no	Content	Page No.
1	Problem Statement	3
2	Project Goals 2.1 Scope of project. 2.2 What will be done. 2.3 What won't be done. 2.4 Expected Results.	4-5
3	Data Identification 3.1 Data source 3.2 Data Set 3.3 Data handling and Cleaning 3.4 Engagement Variable. 3.5 Reach Variable 3.6 Conversion Variable 3.7 Comparative Analysis Variables	5-7
4	Data Visualization 4.1-4.3 Histogram 4.4-4.5 Interval plot 4.6-4.7 Box Plot	8
5	Hypothesis Testing 5.1 Anova 5.2 One Sample T-Test Analysis 5.3 Paired Testing	
6	Bibliography	

## 1. Problem Statement:

*“Analyzing the Effectiveness of Digital Marketing Platforms in Driving Sales and Customer Reach: A Comparative Study of Instagram and Alternative Platforms.”*

Social media has become a bridge to maintain a personal relationship between a brand and its followers. With over 455 billion users and 4 billion posts per day, social media is a platform that has become an essential tool of marketing for a small, medium or large type of business [1]. Businesses use a variety of social media channels in the current era of digital marketing to interact with their target audience and promote their products. Facebook, the most popular social media platform, has recorded a monthly active user rate of 2,375 million in April 2019 (Statista, 2019). Likewise, the number of monthly active Instagram users has increased from 90 million in January 2013 to 1,000 million in June 2018. Correspondingly, social media content directed at customers continues to proliferate as customers' digital spending increases (Malthouse, Calder, & Vandenbosch, 2016). Social media advertising revenue has grown 30.6% in the U.S. in 2018 alone to \$28.9b (PwC, 2019) [2]. Instagram has been a popular option for brands looking to improve their online visibility and increase sales among these platforms. However, the effectiveness of Instagram compared to other platforms in terms of generating sales and reaching customers remains an area of interest and inquiry.

The study will involve the selection of 5 different markets representing diverse industries. In total of 6 social media platforms are selected, where each industries use different platform for their digital marketing purpose. Data will be collected on sales performance metrics and customer engagement metrics. Using engineering probability and statistics concepts, the collected data will be analyzed to compare the effectiveness of Instagram relative to alternative platforms in driving sales and customer engagement. Statistical tests such as hypothesis testing, involving ANOVA, One Sample T-Testing and Paired Testing are used to identify significant differences and relationships between the variables of interest.

The project expects to provide empirical evidence supporting the hypothesis that Whether Instagram is more effective than alternative platforms in driving sales and reaching customers for businesses engaged in digital marketing.

## **2. Project Goals:**

This project aims to investigate and compare the effectiveness of Instagram as a digital marketing platform in driving sales and customer reach, relative to alternative platforms. Specifically, the objectives are to:

- Identify factors that contribute to the effectiveness of digital marketing strategies on Instagram compared to other platforms.
- Assess the sales performance and customer engagement metrics of businesses utilizing Instagram vs other platforms for digital marketing.
- We aim to analyze the statistical significance of differences in sales and customer reach between Instagram and alternative platforms, employing a variety of statistical tests such as ANOVA, t-tests, and z-tests for comprehensive hypothesis testing.

### **2.1. Scope of the Project:**

### **2.2. What Will Be Done:**

- Selection of companies from 10 diverse industries that use Instagram as a core digital marketing platform, alongside companies using other social media platforms, to form a comparative study group.
- Collection of data on predefined sales performance metrics and customer engagement metrics over a specified period.
- Application of engineering probability and statistics concepts to analyze and compare the effectiveness of Instagram with other platforms in enhancing sales and customer engagement.
- Execution of hypothesis testing, regression analysis, and correlation analysis to investigate significant differences and trends.

### **2.3. What Won't Be Done:**

- The project will not delve into the individual strategies of specific brands or the qualitative analysis of content.
- The study will not include real-time data analysis, nor will it forecast future market trends beyond the scope of the collected data.

## 2.4. Expected Results:

- Illustrating Instagram vs other platforms represented using visualizations like histogram, scatterplot and box plot.
- Evaluate and visualize the sales and customer engagement between Instagram and other digital marketing platforms by conducting a series of statistical tests, including ANNOVA, t-tests, and z-tests, to thoroughly assess the hypothesis regarding their respective efficacies.

## 3. Data Identification:

### 3.1 [Data Source:](#)

We obtained our dataset from a single online source available on the internet. This source was selected based on its relevance to our research topic and the availability of the required data.

### 3.2 Data Set: Digital Marketing – PFA the link [here](#)

### 3.3 Data Handling and Cleaning:

After retrieving the data, we conducted thorough data handling and cleaning processes to ensure its quality and reliability for analysis. This included replacing missing values with the mean of the respective features, removing outliers that could potentially skew the analysis results, and eliminating columns that were deemed irrelevant to our research objectives.

The dataset comprises approximately 10,000 rows and 14 columns. The columns in the dataset include:

### 3.4. Engagement Variables:

- **Clicks:** Represents the number of times users have clicked on the content. It indicates the level of interest or interaction generated by the content.
- **Likes:** Shows the number of likes or positive reactions received on the content. Higher likes generally suggest a higher level of audience appreciation.
- **Comments:** Indicates the number of comments or discussions sparked by

the content. More comments often signify higher engagement and interest.

- **Shares:** Reflects the number of times the content has been shared by users. It indicates the content's viral potential and reach beyond the original audience.
- **Engagement Rate:** Engagement Rate is a measure of how many people interact with specific content. This digital marketing metric includes many forms of interaction, such as likes, comments, shares, and clicks.[3]

### 3.5. Reach Variables:

- **Followers/Subscribers:** Represents the number of followers or subscribers to the platform or account. It indicates the potential audience reach for the content.
- **Impressions:** Indicates the total number of times the content has been displayed to users. It represents the potential visibility or exposure of the content. Impressions are an indication of Brand Awareness and can be effective in measuring how many people are encountering your organization on social. [4]
- **Platform:** Indicates the platform where the content is published (e.g., Facebook, Instagram, X(Twitter)). Platform choice can impact audience demographics and engagement.

### 3.6. Conversion Variables:

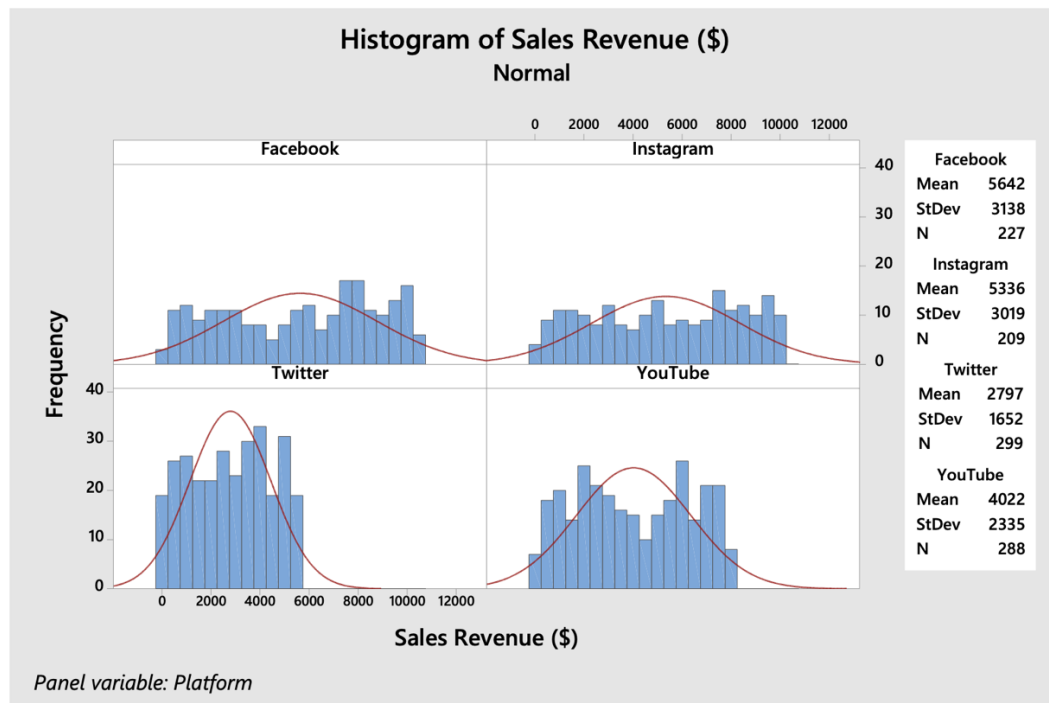
- **Conversions:** Reflects the number of desired actions taken by users, such as making a purchase or signing up for a service. It measures the effectiveness of the content in driving desired outcomes.
- **Conversion Rate:** Represents the percentage of users who complete the desired action out of the total audience. A higher conversion rate indicates better effectiveness in driving conversions.
- **Sales Revenue (\$):** Represents the total revenue generated from sales attributed to the content. It reflects the monetary impact of the content on the business.

### 3.7. Comparative Analysis Variables:

- **Cost Per Click (CPC):** Indicates the average cost incurred for each click on the content. It measures the efficiency of advertising campaigns in driving traffic.
- **Cost Per Impression (CPI):** Represents the cost per thousand impressions of the content. It helps evaluate the cost-effectiveness of advertising campaigns in generating visibility.
- **Return on Investment (ROI):** Reflects the profitability of the content by comparing the revenue generated to the investment made. A positive ROI indicates a profitable return, while a negative ROI suggests a loss.

## 4. Data Visualization

### 4.1 Entertainment Industry



**Fig 1**

We have used Histogram to show bars whose heights correspond to the frequency of sales revenue occurrences within specific ranges. From the above graph we can infer that Facebook and Instagram exhibit higher average sales revenues compared to Twitter and YouTube, suggesting that they are potentially more effective platforms for revenue generation in the entertainment industry. However, the standard deviation for Facebook

and Instagram is also higher, indicating a larger variation in revenue. X has the lowest mean revenue but also a lower standard deviation, which suggests less variability in the revenue generated. The data points are closer to the mean, indicating that revenue amounts are more consistent but generally lower. YouTube shows a moderate mean sales revenue with a standard deviation lower than Facebook and Instagram but higher than X. This suggests a middle ground in terms of both average revenue and consistency. The higher number of observations for Twitter and YouTube indicates that they were used more frequently for marketing in this data set, even if the average sales revenue was lower.

### **Statistical Data:**

#### Facebook:

- Mean: \$5,642
- Standard Deviation: \$3,138
- Observations: 227

#### Instagram:

- Mean: \$5,336
- Standard Deviation: \$3,019
- Observations: 209

#### X (Twitter)

- Mean: \$2,797
- Standard Deviation: \$1,652
- Observations: 299

#### YouTube:

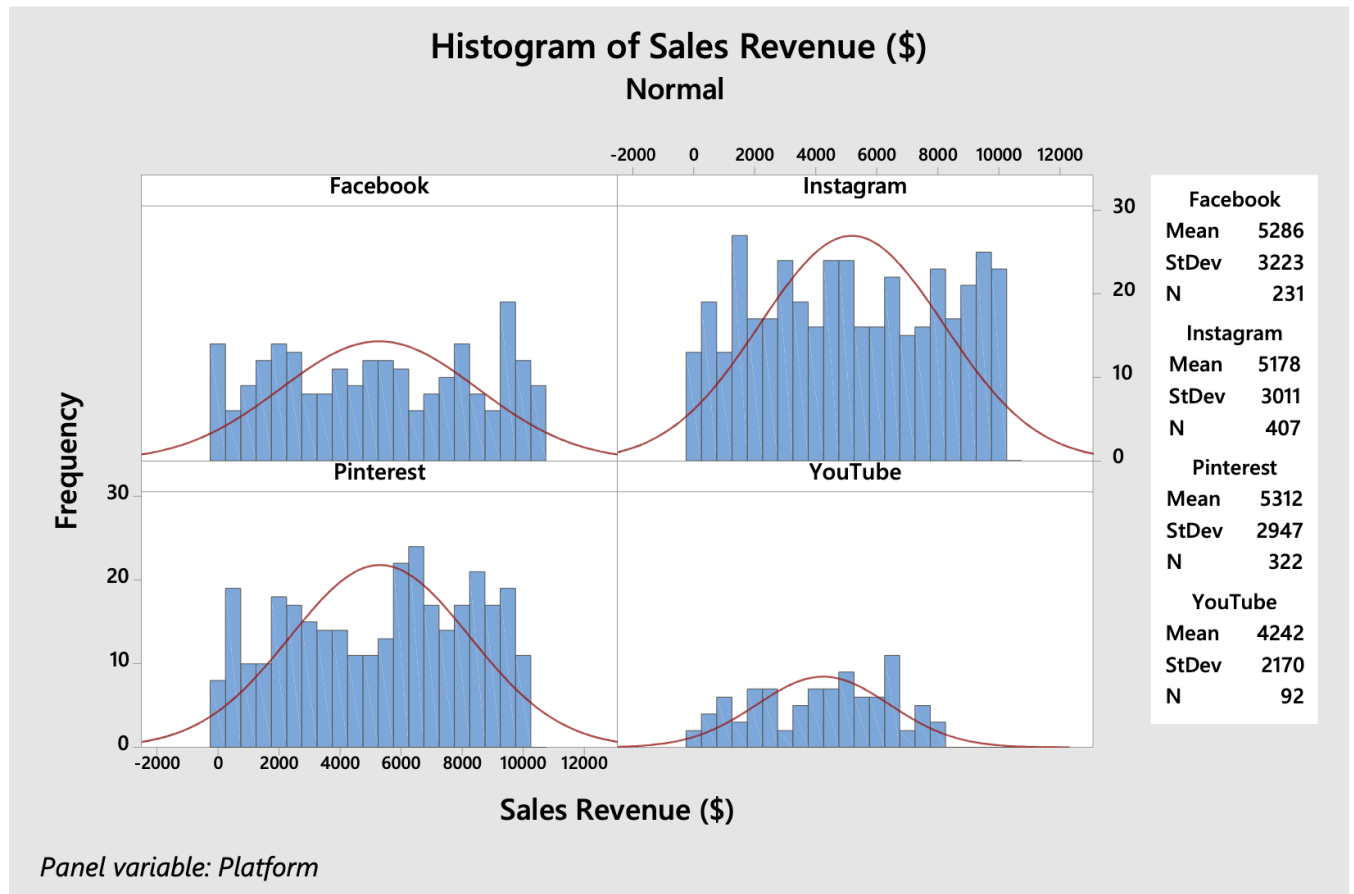
- Mean: \$4,022
- Standard Deviation: \$2,335
- Observations: 288

### **Conclusion**

This could suggest Facebook and Instagram for potentially higher revenues, while also using Twitter and YouTube for their consistent user base and specific content strategies that align with those platforms.

## **4.2 Food and Beverage Industry**





**Fig 2**

Here in histogram, it shows that all three platforms, Facebook, Instagram, and Pinterest, have a comparable mean sales revenue of around \$5,200-\$5,300, with Pinterest slightly leading. YouTube lags with a mean of \$4,242. The means suggest that, on average, these platforms generate similar levels of sales revenue in the food industry, but YouTube might not be as effective in this context. The standard deviations are relatively high for all platforms, particularly for Facebook, indicating a wide spread of revenue figures around the mean. This variability suggests that while there can be highly successful campaigns that generate substantial revenue, there are also campaigns that underperform. Instagram has the highest number of observations, indicating that it is a frequently used platform for marketing in the food industry, potentially providing a larger data set that could offer more reliability in the mean and standard deviation estimates. Pinterest also shows many observations, implying its importance in the food industry, which often relies heavily on visual appeal—something Pinterest caters to effectively. YouTube, despite having the lowest mean, has the lowest standard deviation as well, suggesting that sales revenue figures on this platform are more consistent, albeit lower on average. However, the smaller

number of observations for YouTube indicates a smaller sample size, which can make the mean less reliable than the other platforms.

**Statistical Data:**

Facebook:

- Mean: \$5,286
- Standard Deviation: \$3,223
- Observations: 231

Instagram:

- Mean: \$5,178
- Standard Deviation: \$3,011
- Observations: 407

Pinterest:

- Mean: \$5,312
- Standard Deviation: \$2,947
- Observations: 322

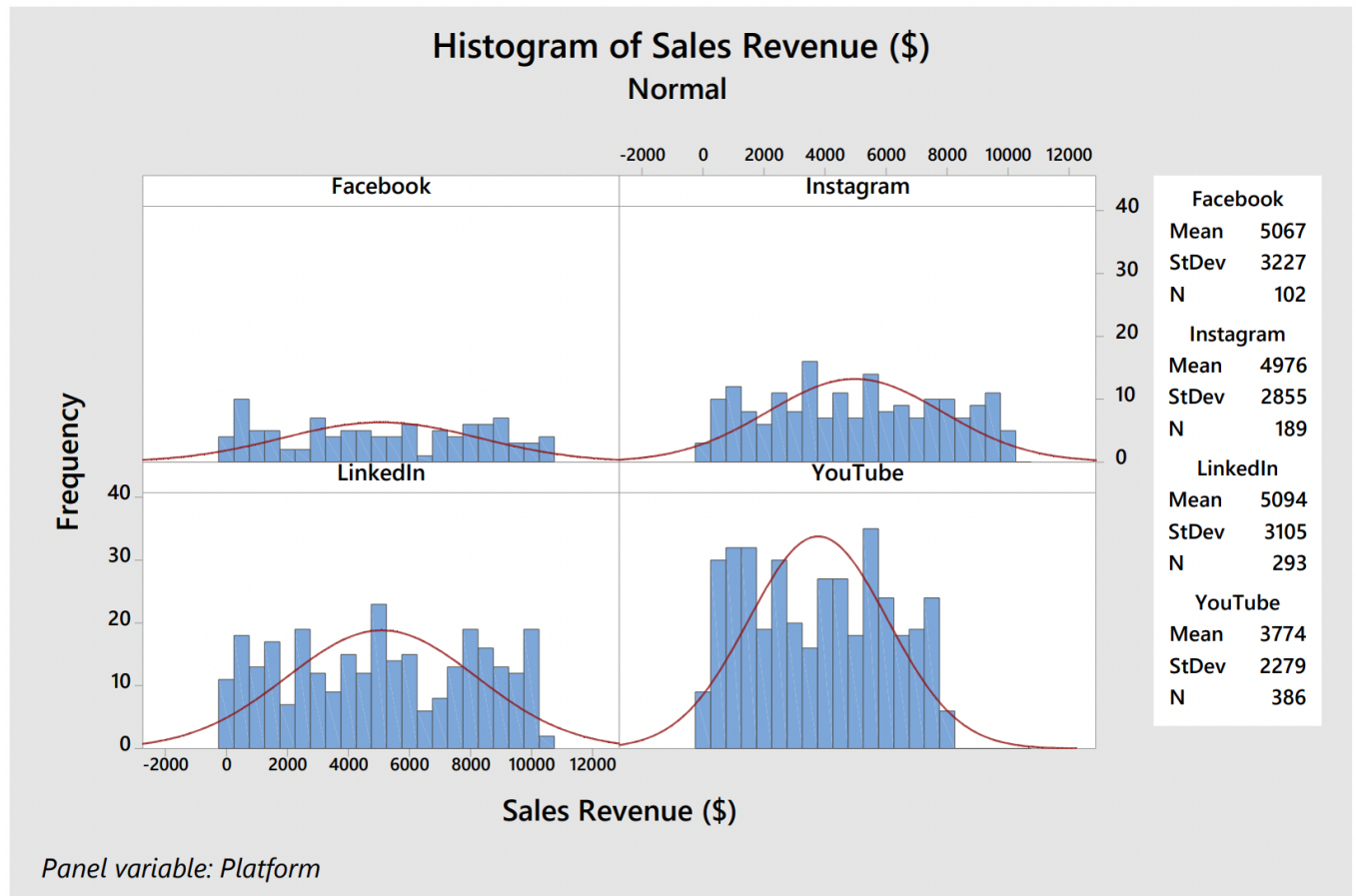
YouTube:

- Mean: \$4,242
- Standard Deviation: \$2,170
- Observations: 92

**Conclusion:**

Overall, the histogram suggests that in the food industry, while there are differences in the effectiveness of each platform, there is no overwhelmingly dominant platform in terms of sales revenue generation. Marketers should consider the variability and consistency in revenue generation when allocating resources across these digital marketing platforms.

### 4.3 Education Industry



**Fig 3**

The histogram from illustrates the distribution of sales revenue generated by four social media platforms—Facebook, Instagram, LinkedIn, and YouTube—in the education sector. This type of graph is useful for visualizing the frequency distribution of sales figures and gaining insights into which platforms might be most effective in this context. Here's an analysis of the histogram:

*Technical Overview of the Histogram:*

- X-axis: Represents the sales revenue (\$) generated.
- Y-axis: Represents the frequency of occurrence of sales revenue within specific ranges.
- Bars: Each bar reflects the number of observations within a given revenue range, allowing us to understand the distribution of revenue amounts.

## Statistical Data:

### Facebook:

- Mean: \$5,067
- Standard Deviation (StDev): \$3,227
- N (Sample Size): 102

### Instagram:

- Mean: \$4,976
- Standard Deviation: \$2,855
- N: 189

### LinkedIn:

- Mean: \$5,094
- Standard Deviation: \$3,105
- N: 293

### YouTube:

- Mean: \$3,774
- Standard Deviation: \$2,279
- N: 386

● Facebook: Shows a higher mean revenue than Instagram and YouTube but less than LinkedIn. The spread (indicated by standard deviation) is wide, suggesting that revenue figures vary significantly across different campaigns or uses within the education sector.

● Instagram: Features a slightly lower mean revenue compared to Facebook and LinkedIn but higher than YouTube. Its standard deviation is less than that of Facebook and LinkedIn, indicating more consistency in the revenue figures it generates.

● LinkedIn: Has the highest mean sales revenue among the platforms and a high standard deviation, indicating that while it can generate high revenues, these results are quite variable.

● YouTube: Displays the lowest mean revenue and the largest number of data points (N), suggesting it is frequently used but less effective at generating high revenue figures in the education sector.

**Conclusion:** The histogram reveals that LinkedIn, despite its variability, potentially offers the highest revenue peaks, which might be attributed to its professional network and content consumption behavior in the education sector. Instagram and Facebook also show promising results but with greater consistency in Instagram's performance. YouTube, while

popular for content dissemination, may not translate as effectively into direct revenue generation in this context. Understanding these distributions is crucial for tailoring digital marketing strategies in the education sector. The data suggests that while LinkedIn might be leveraged for potentially high, albeit variable, returns, Instagram could be a more reliable medium for steady revenue. Decisions on platform usage should consider these factors, alongside the specific nature of the educational content and target audience characteristics.

4.4 Interval Plot of Sales Revenue

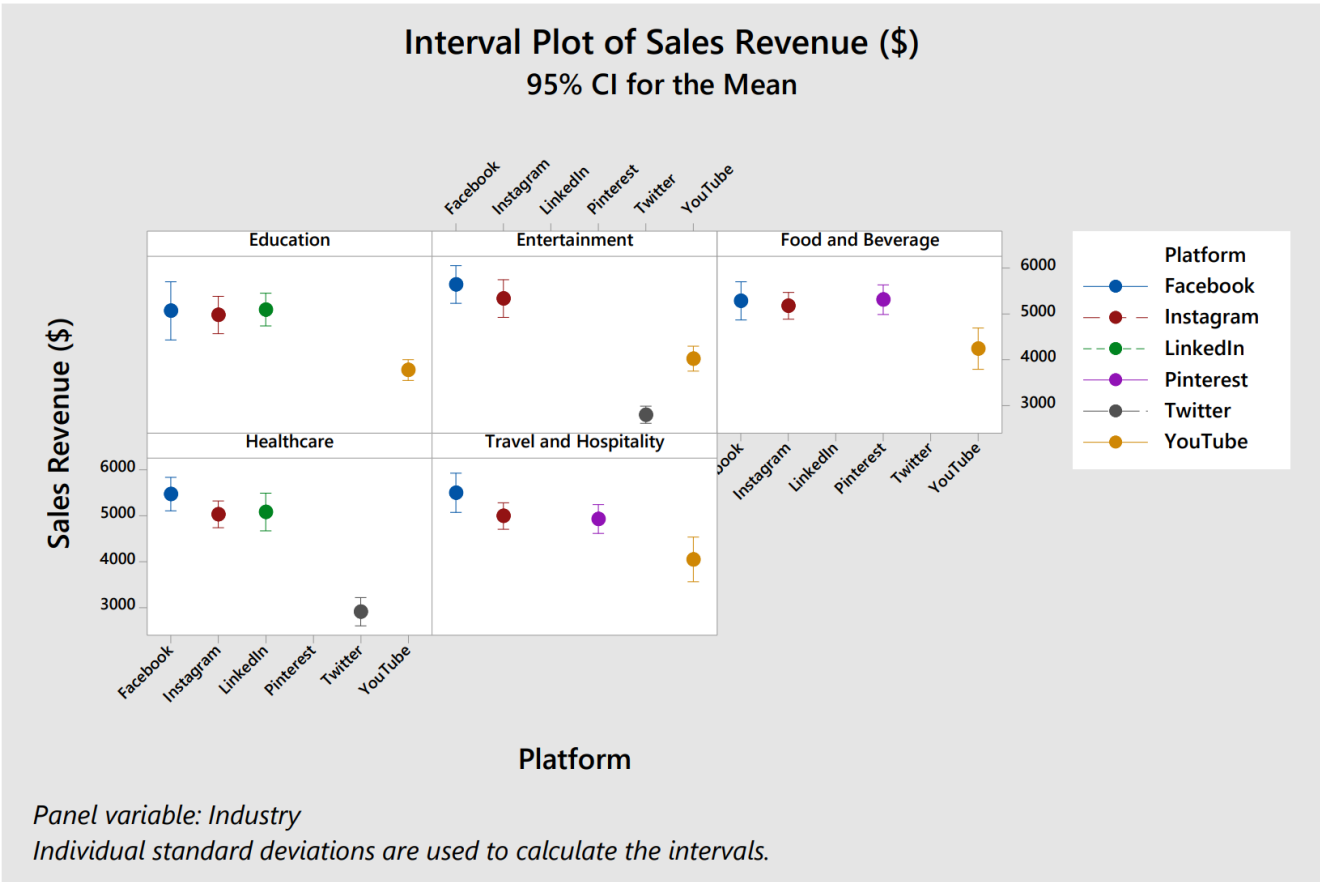


Fig 4

The Interval Plot provides a visual representation of the average sales revenue generated by various social media platforms across different industries, with a 95% confidence interval for the mean. This type of graph helps in comparing the mean sales revenues and understanding the statistical significance of the differences observed between the platforms within specific industries.

From the Interval Plot, we can deduce the following:

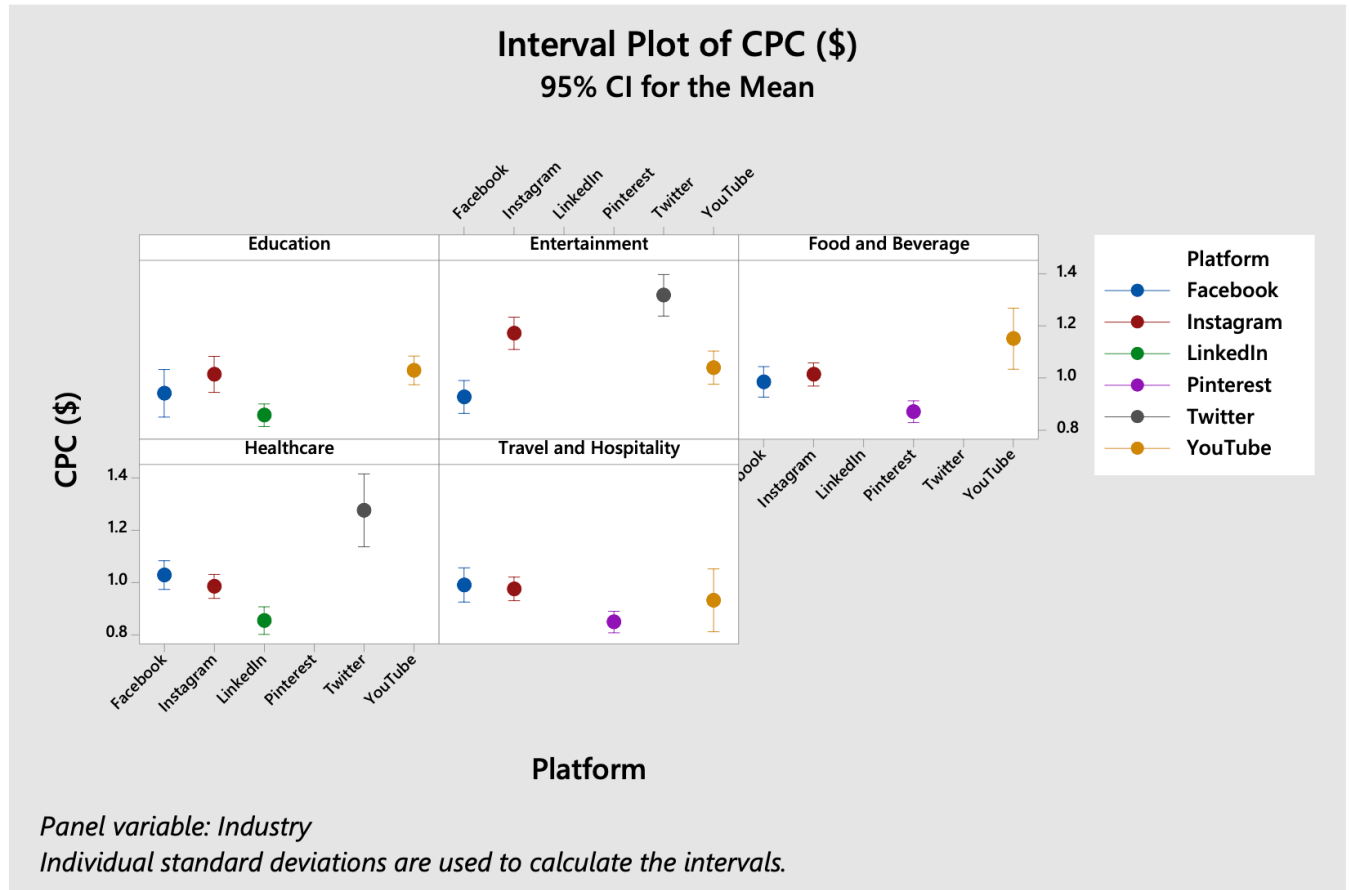
1. **Facebook** shows the highest average sales revenue in the education industry, significantly outperforming other platforms. Its performance in travel and hospitality also appears strong but with a wider confidence interval, indicating more variability in this sector.
2. **Instagram** demonstrates competitive average sales revenues across all industries, with particularly close performance to Facebook in food and beverage, which suggests it's a strong platform for visual content-rich sectors.
3. **LinkedIn** exhibits moderate average sales revenues with relatively narrow confidence intervals across industries, implying consistent performance which might be attributed to its professional network base.
4. **Pinterest** has varying performance across industries, with lower average sales revenue in education but higher in food and beverage, which aligns with its niche in visual inspiration and planning, key aspects for this industry.
5. **Twitter** shows the lowest average sales revenues in travel and hospitality, and also falls behind in other sectors, suggesting it may not be as effective for direct sales generation as other platforms.
6. **YouTube** has a notable average sales revenue in the food and beverage industry, but it's less effective in education, with a wider confidence interval in travel and hospitality, indicating variability in performance.

#### **Conclusion:**

Our Interval Plot analysis using Minitab revealed distinct patterns of average sales revenue by social media platform across various industries. Facebook and Instagram lead in generating revenue, especially in visually driven sectors like education and food and beverage. LinkedIn shows consistent, moderate revenue across the board.

Pinterest's performance peaks in the food and beverage sector, X generally underperforms in generating sales revenue, particularly in travel and hospitality. YouTube, while effective in food and beverage, demonstrates variability in other sectors. These insights are crucial for tailoring platform-specific marketing strategies to optimize ROI in diverse industries.

## 4.5 Interval plot or CPC



**Fig 5**

The graph indicates the mean CPC and the range of the 95% CI for each platform within the three industries. The platforms included are Facebook, Instagram, LinkedIn, Pinterest, Twitter, and YouTube.

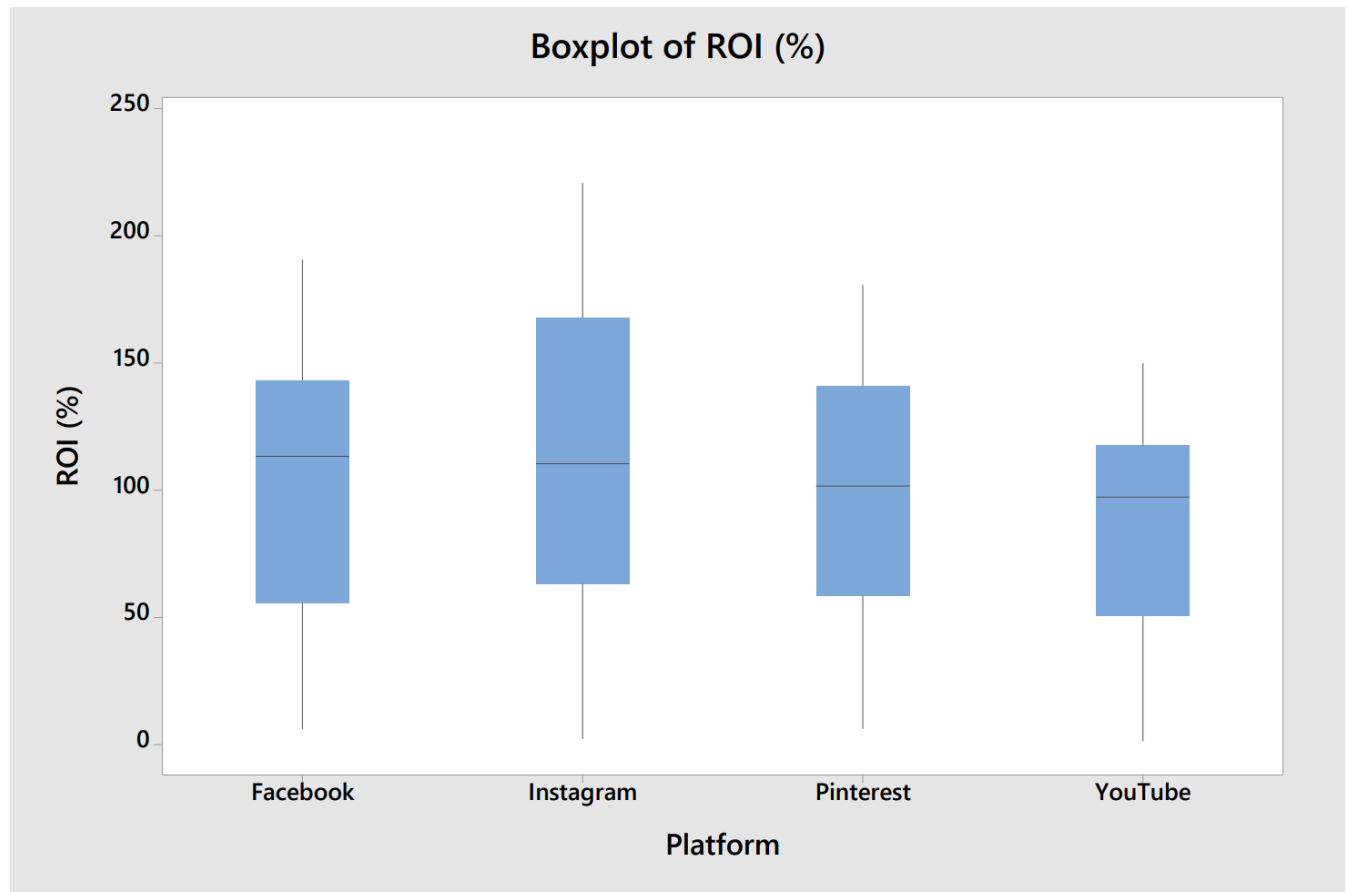
**Education:** The mean CPC values range from slightly under \$1 to roughly \$1.4, with LinkedIn having the highest mean CPC and Twitter and Pinterest being at the lower end. The confidence intervals suggest that LinkedIn's CPC data is more variable compared to other platforms.

**Healthcare:** The CPC values are generally lower than in Education, mostly between approximately \$0.8 and \$1.2. Instagram has the highest mean CPC in this sector, while Facebook has the lowest. Again, LinkedIn shows a larger confidence interval, indicating higher variability or a smaller sample size.

**Travel and Hospitality:** This sector shows a wide range of CPC values with Twitter having the highest mean CPC at approximately \$1.31682, which is specifically highlighted in the

graph. YouTube shows the lowest mean CPC. The confidence intervals are relatively small compared to the other sectors, suggesting more precise estimates of the mean CPC.

#### 4.6 Box Plot 1



**Fig 6**

The box plot provided by Minitab displays the Return on Investment (ROI) percentages across four social media platforms—YouTube, Pinterest, Instagram, and Facebook—specifically within the travel industry. This type of graph is excellent for visualizing the distribution of ROI data, showing median values, quartile ranges, and potential outliers, which helps in assessing the performance of each platform in terms of investment returns.

##### Graph Overview:

- Y-axis: Indicates the ROI (%) achieved by each platform.
- X-axis: Categorized by social media platform.
- Box Elements:
  - The central line in the box: Represents the median ROI.



- Top and bottom of the box: Indicate the third (Q3) and first (Q1) quartiles, respectively.
- Whiskers: Extend from the quartiles to the maximum and minimum values within 1.5 times the interquartile range (distance between Q1 and Q3).
- Outliers: Points beyond the whiskers suggest ROI data that are unusually high or low.

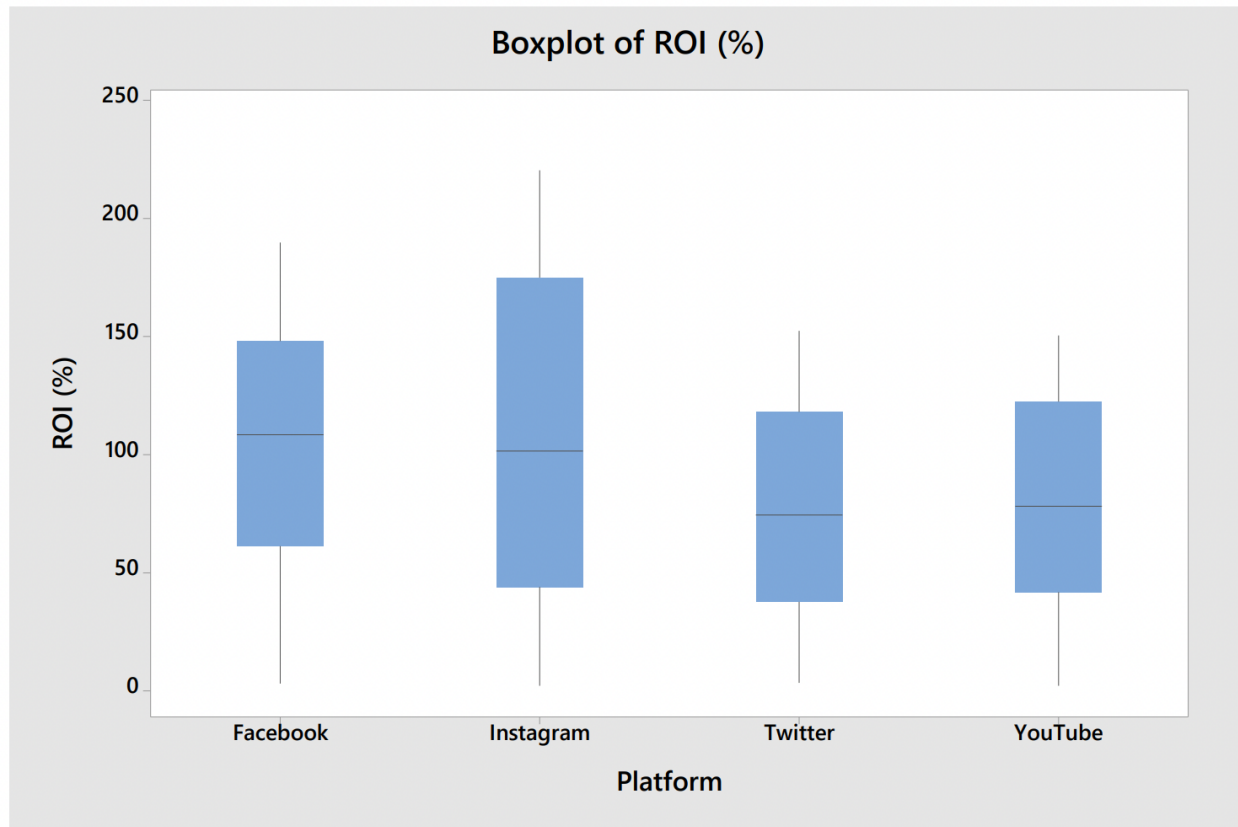
Analysis of ROI in the Travel Industry:

- Platform Performance:

- Facebook and Instagram often have higher medians and wider interquartile ranges, indicating not only a higher typical ROI but also greater variability in ROI outcomes. Their wide range suggests that while many campaigns perform well, the results can vary significantly.
- Pinterest shows a more compact interquartile range, centered around a median that is lower than Facebook but higher than YouTube. This consistency might make Pinterest a reliable platform for achieving moderate, predictable returns.
- YouTube exhibits the lowest median ROI and a narrow range, suggesting it consistently yields lower returns in the travel sector. This could be due to the nature of how travel content is consumed on YouTube, which may not directly drive conversions as effectively as other platforms.

**Conclusion:** This box plot provides valuable insights into the ROI distribution for social media marketing in the travel industry. It highlights the need for tailored marketing strategies that consider both the average ROI potential and the variability in outcomes on each platform. Marketers can use this information to better allocate budgets, design content, and set expectations for campaign performance, ultimately aiming to maximize the effectiveness of their investments in social media advertising.

## 4.7 Box Plot 2



**Fig 7**

**Facebook:** The median ROI for Facebook is depicted by the line within the box, which is above the median for Instagram, Twitter, and YouTube. The IQR for Facebook is moderate, suggesting that while ROI varies, it does not have as wide a spread as Instagram. This indicates a somewhat consistent performance relative to Instagram, with a tendency for higher median ROI.

**Instagram:** Although Instagram has a lower median ROI than Facebook in this graph, it has the highest IQR, suggesting a wider range of ROI percentages. This higher variability implies that while some Instagram campaigns may yield very high ROIs, others may fall much lower, indicating a less predictable performance.

**Twitter:** The median ROI for Twitter is lower than for Facebook and Instagram, and the IQR is narrower than that of Instagram but slightly wider than that of Facebook. This indicates a more consistent ROI than Instagram but with less likelihood of very high returns.

**YouTube:** The median ROI for YouTube is comparable to that of Twitter but with an IQR that is also similar in spread to Instagram's. This suggests YouTube campaigns can also see a wide range of ROI outcomes, but without the higher median that Instagram exhibits.

**Conclusion:** The boxplot indicates that Facebook leads with the highest median ROI, suggesting that on average, investments in Facebook may yield better returns than the other platforms examined. However, the fact that Instagram has a wider IQR can be interpreted to mean that while the average ROI on Instagram is lower, there is a potential for much higher returns, albeit with a higher risk due to greater variability. Twitter and YouTube present more consistent ROI outcomes, with YouTube showing potential for a wide range of returns, like Instagram.

## 5. Hypothesis Testing.

**5.1 ANOVA:** ANOVA, which stands for Analysis of Variance, is a statistical method used to compare the means of three or more samples to see if at least one of them differs significantly from the others. It's particularly useful when you want to test the effects of one or more categorical independent variables on a continuous dependent variable.

WORKSHEET 6

### One-way ANOVA: Sales Revenue (\$) versus Platform

#### Method

Null hypothesis All means are equal  
Alternative hypothesis Not all means are equal  
Significance level  $\alpha = 0.05$

Equal variances were assumed for the analysis.

#### Factor Information

Factor	Levels	Values
Platform	4	Facebook, Instagram, Twitter, YouTube

#### Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Platform	3	1330579336	443526445	69.54	0.000
Error	1019	6499141861	6377961		
Total	1022	7829721197			

#### Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2525.46	16.99%	16.75%	16.30%

#### Means

Platform	N	Mean	StDev	95% CI
Facebook	227	5642	3138	(5313, 5971)
Instagram	209	5336	3019	(4993, 5679)
Twitter	299	2797.4	1651.6	(2510.8, 3084.0)
YouTube	288	4022	2335	(3730, 4314)

Pooled StDev = 2525.46

#### Tukey Pairwise Comparisons

##### Grouping Information Using the Tukey Method and 95% Confidence

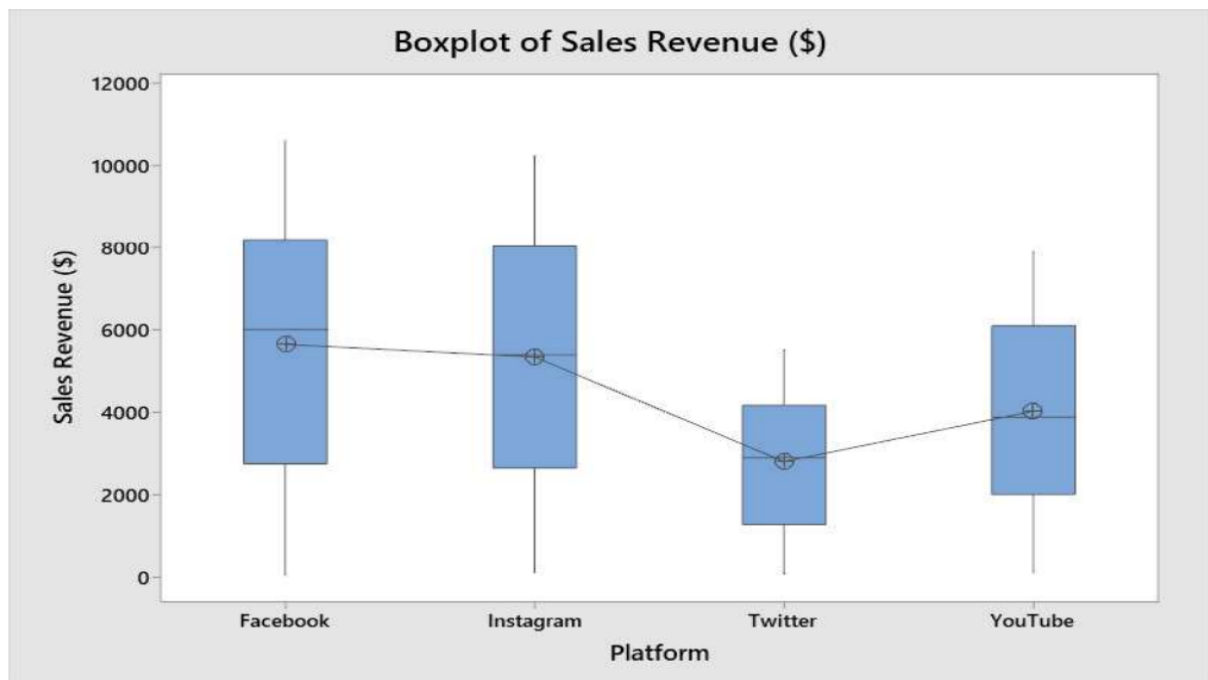
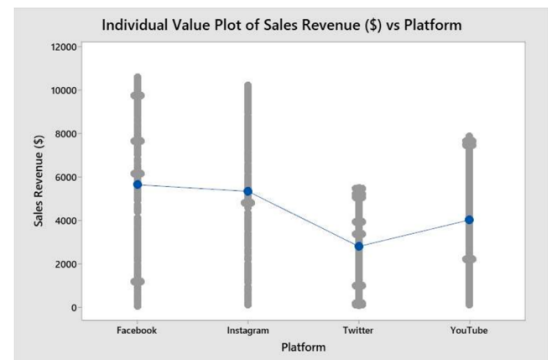
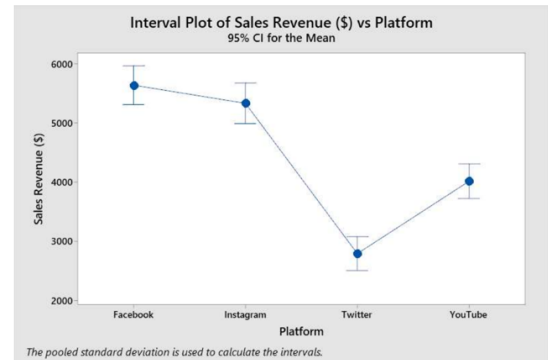
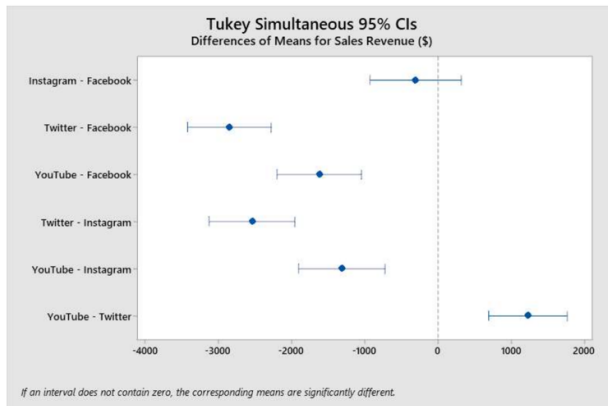
Platform	N	Mean	Grouping
Facebook	227	5642	A
Instagram	209	5336	A
YouTube	288	4022	B
Twitter	299	2797.4	C

Means that do not share a letter are significantly different.

#### Tukey Simultaneous Tests for Differences of Means

Difference of Levels	Difference of Means	SE of Difference	95% CI	T-Value	Adjusted P-Value
Instagram - Facebook	-307	242	(-928, 315)	-1.27	0.584
Twitter - Facebook	-2845	222	(-3416, -2274)	-12.80	0.000
YouTube - Facebook	-1621	224	(-2196, -1045)	-7.23	0.000
Twitter - Instagram	-2538	228	(-3123, -1954)	-11.15	0.000
YouTube - Instagram	-1314	229	(-1903, -725)	-5.73	0.000
YouTube - Twitter	1224	209	(689, 1759)	5.87	0.000

Individual confidence level = 98.96%



This is generated using Minitab, and illustrates statistical analyses on sales revenue (\$) across different social media platforms.

Let's dissect the findings:

### **One-way ANOVA: Sales Revenue (\$) versus Platform**

The ANOVA (Analysis of Variance) has been performed to determine if there are any statistically significant differences in the sales revenue between the different social media platforms.

- Null hypothesis,  $H_0$ : All means are equal (there's no difference in sales revenue across platforms).
- Alternative hypothesis,  $H_a$ : Not all means are equal (at least one platform has a different sales revenue).
- Significance level:  $\alpha = 0.05$

The P-value is less than 0.05, leading to the rejection of the null hypothesis. This indicates that there are significant differences in sales revenue across platforms.

### **Tukey Pairwise Comparisons**

This post-hoc test identifies which specific groups' means (platforms) are different. The grouping letters (A, B, C) indicate platforms that are not significantly different from each other when they share a letter.

- Facebook and Instagram belong to the same group, indicating similar sales revenue performance.
- X shows significantly lower sales revenue, as indicated by its unique grouping letter C.
- YouTube sits in between, differing from Facebook/Instagram and Twitter, showing distinct sales revenue figures.

### **Interval Plot of Sales Revenue (\$) vs Platform**

The interval plot provides a visual representation of the mean sales revenue per platform, along with the 95% confidence intervals. Facebook and Instagram have higher mean sales revenues with overlapping confidence intervals, suggesting no significant difference between them. Twitter and YouTube show lower mean sales revenues.

### **Individual Value Plot of Sales Revenue (\$) vs Platform**

This plot shows the spread and individual data points for sales revenue across each platform. The variability is quite pronounced for all platforms, indicated by the spread of the data points.

### **Boxplot of Sales Revenue (\$)**

The boxplot gives a more detailed look at the distribution of sales revenue.

- Central line: Median sales revenue.
- Box: Interquartile range (middle 50% of data).
- Whiskers: Extend to the most extreme data points not considered outliers.
- Circles: Potential outliers or unusual values.

### **Residual Plots for Sales Revenue (\$)**

These plots help assess the fit of the model.

- Normal Probability Plot: Residuals fall along the straight line reasonably well, suggesting that the data meet the assumption of normality.
- Versus Fits: There's no apparent pattern, indicating good model fit.
- Histogram: Shows the distribution of residuals; should be approximately normally distributed for a good model fit.
- Versus Order: Checks for random distribution of residuals; no pattern suggests residuals are independent over time.

In summary, the statistical analysis indicates significant differences in sales revenue across the social media platforms.

## 5.2 One Sample T-Test Analysis

WORKSHEET 1

### One-Sample T: ROI (%)

#### Descriptive Statistics

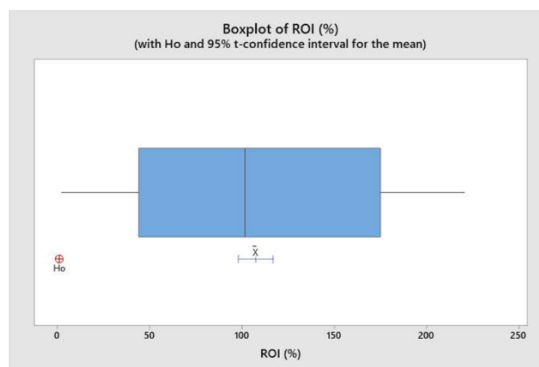
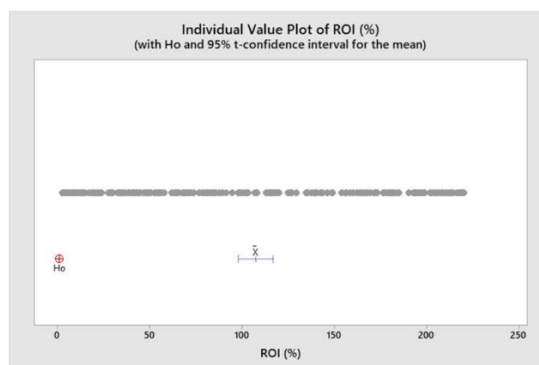
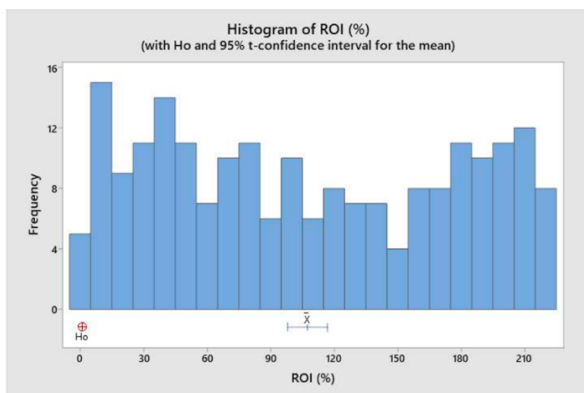
N	Mean	StDev	SE Mean	95% CI for $\mu$
209	107.44	69.03	4.77	(98.02, 116.85)

$\mu$ : mean of ROI (%)

#### Test

Null hypothesis  $H_0: \mu = 0.8$   
Alternative hypothesis  $H_a: \mu \neq 0.8$

T-Value	P-Value
22.33	0.000



WORKSHEET 1

### One-Sample T: ROI (%)

#### Descriptive Statistics

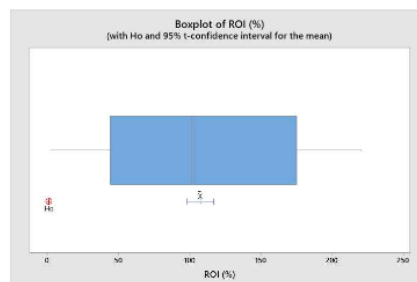
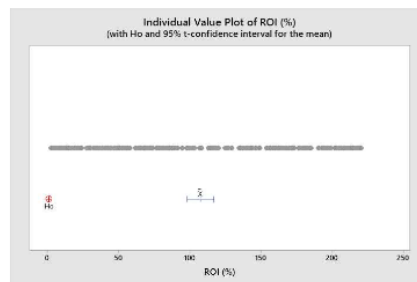
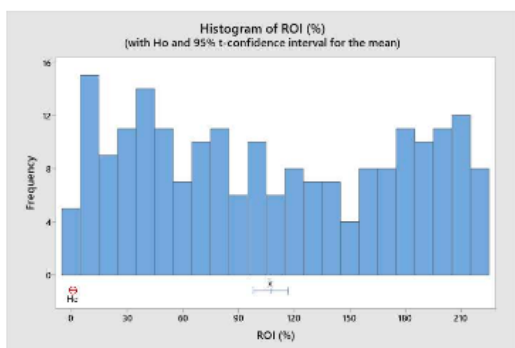
N	Mean	StDev	SE Mean	95% CI for $\mu$
209	107.44	69.03	4.77	(98.02, 116.85)

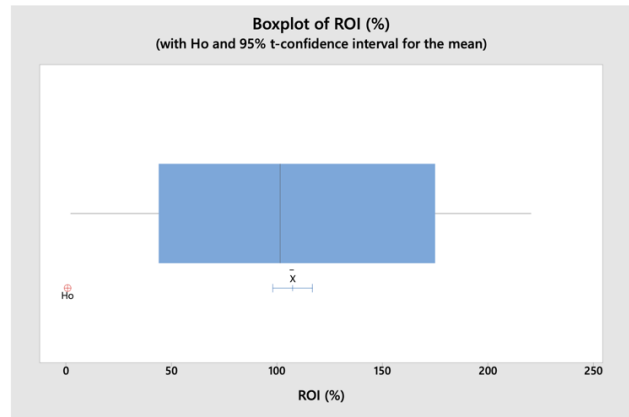
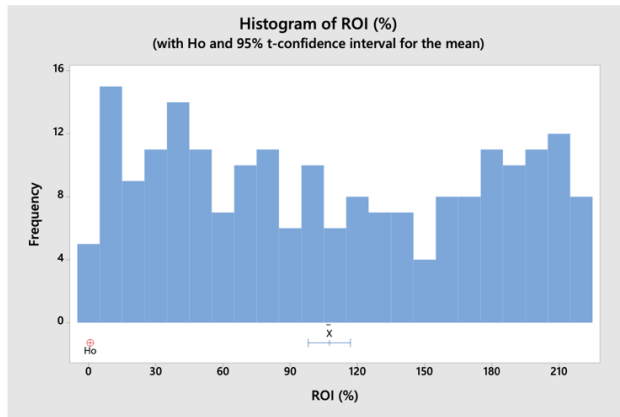
$\mu$ : mean of ROI (%)

#### Test

Null hypothesis  $H_0: \mu = 0.8$   
Alternative hypothesis  $H_a: \mu \neq 0.8$

T-Value	P-Value
22.33	0.000





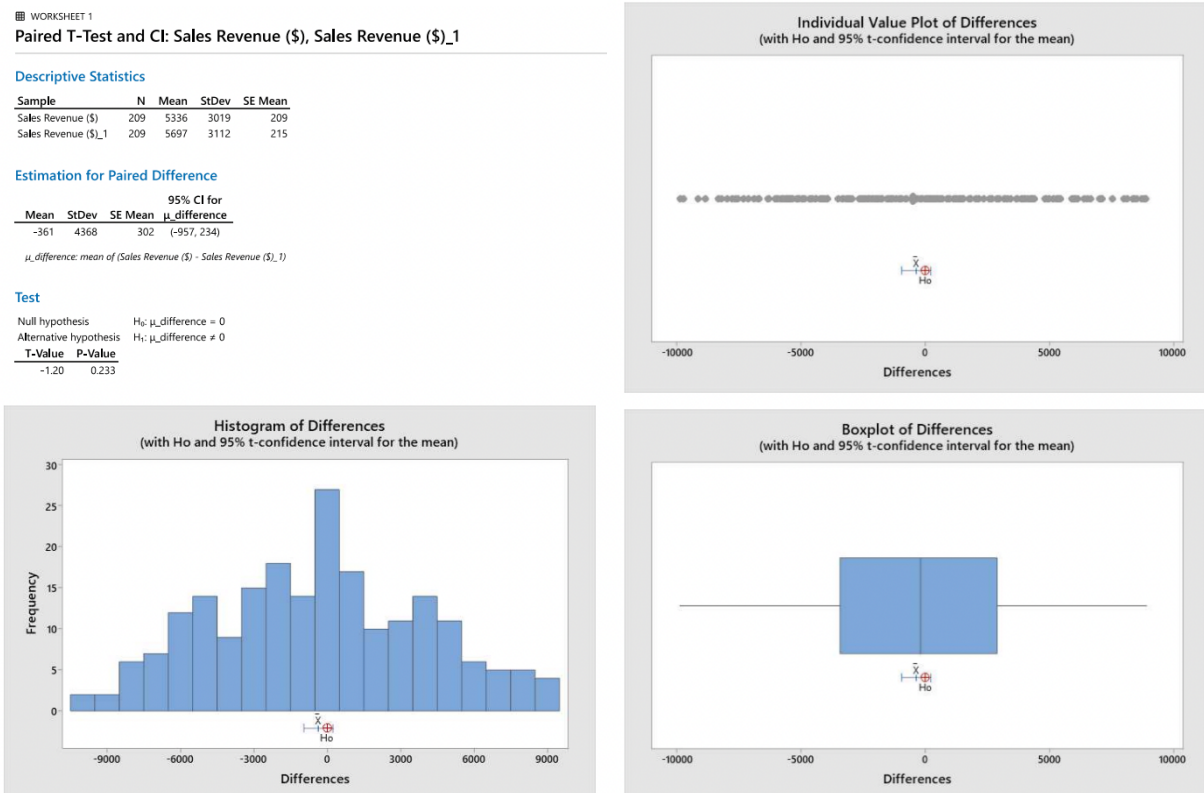
**Descriptive Statistics:** The analysis included 209 data points, with the mean ROI calculated as 107.44%. The standard deviation, a measure of data dispersion, was 69.03%. The standard error of the mean was 4.77, indicating the precision of the sample mean as an estimate of the population mean. The 95% confidence interval (CI) for the true mean ROI was between 98.02% and 116.85%, suggesting that we can be 95% confident that the population mean ROI falls within this range.

**Test Results:** A T-value of 22.33 and a P-value of 0.000 were obtained. The P-value is less than the commonly used significance level of 0.05, which leads us to reject the null hypothesis. This indicates that there is a statistically significant difference between the sample mean ROI and the hypothesized value of 80%.

**Conclusion:** The statistical analysis conclusively demonstrates that the mean ROI for Instagram ads in the entertainment industry is significantly different from the hypothesized 80%. In fact, the average ROI is considerably higher.



## 5.3 Paired Testing



## Hypothesis Testing

Given the paired T-test analysis for sales revenue between Instagram and Facebook in the entertainment industry, we arrive at the following conclusion:

### Examination of Sales Revenue

Our analysis explored the relationship between the sales revenues generated from Instagram and Facebook within the entertainment sector. We executed a paired T-test to determine the likelihood of any significant differences in revenue generation by these two prominent social media platforms.

### Paired T-test Results

The descriptive statistics indicated a minimal average difference in sales revenue between Instagram and Facebook. The test yielded a P-value above the standard cutoff of 0.05, which suggests that the null hypothesis—that there is no difference in sales revenue—cannot be rejected for the entertainment industry as a whole.

## **Implications for Marketing Strategy**

Given the close performance in sales revenue between Instagram and Facebook in the entertainment sector, as evidenced by the paired T-test, marketing strategies can be designed with flexibility. The selection between Instagram and Facebook for promotional activities does not need to hinge on revenue differences but can instead focus on other factors such as content engagement, campaign objectives, and target demographics.

## **Conclusive Thoughts**

In conclusion, the paired T-test indicates that both Instagram and Facebook are nearly equivalent in their capacity to generate sales revenue in the entertainment industry. This finding suggests an equilibrium in their effectiveness as marketing channels within this particular sector. Marketing professionals can thus approach both platforms as viable options for their digital marketing mix, with decisions guided by campaign specifics rather than revenue performance.

## **5.4 Bibliography:**

- [1][https://www.researchgate.net/publication/360084507\\_Comparative\\_Case\\_study\\_analysis\\_of\\_Social\\_Media\\_Platforms\\_-Instagram\\_Facebook\\_and\\_Snapchat](https://www.researchgate.net/publication/360084507_Comparative_Case_study_analysis_of_Social_Media_Platforms_-Instagram_Facebook_and_Snapchat)
- [2] <https://journals.sagepub.com/doi/full/10.1016/j.intmar.2020.05.001>
- [3] <https://agencyanalytics.com/kpi-definitions/engagement-rate>.
- [4] <https://www.viablecs.org/blog-post/impressions-engagements-clicks-blog/>