

Data Analysis of Key Trends in Online Education Income Growth

Ami A Raj¹, Dr. Geetali Saha^{2*}

¹Student, G H Patel College of Engineering & Technology, Charutar Vidyamandal University

²Faculty, G H Patel College of Engineering & Technology, Charutar Vidyamandal University

Abstract: The online education industry has experienced exceptional growth in recent years, driven not only by the advancements in technology and changing consumer behaviors but more prominently under the influence of COVID-19 pandemic which has brought about a paradigm shift in the thinking of both the employed group that seeks improvement in job opportunities and the ones seeking employment to qualify them for challenging roles in the market and industry. Apart from regular teaching methods, online education has a very significant role in this sector and the income generated out of this online education market is our present domain of interest. In order to investigate key trends in the expansion of online education, this study performs a data analysis on the income of online education platforms. The study focuses on the income growth of the global online education market from 2017 to 2024. The study identifies top-performing countries to evaluate the competitive landscape and market sector of different countries using mathematical analysis and normality tests.

Keywords: online education, annual income, growth rate, market size, data analysis.

I. INTRODUCTION

The online education market has experienced unprecedented growth in the last few years, transforming the way learners enrolled online courses. (Tumurchudur) The digital literacy becomes an asset, empowering students to navigate the digital landscape effectively. (Idowu Sulaimon Adeniyi et al., 2024) The proliferation of smartphones, advancements in digital systems, and the COVID-19 pandemic have accelerated this shift, making e-learning an indispensable part of modern education system. (Aldhafeeri1, 2022) (Khalil, 2020) According to Statista, the global online education market size reached 185.20 bn USD in 2024. This explosive growth has attracted investors, entrepreneurs, and businesses seeking to capitalize on the vast

opportunities presented by the online education market. (Cabual, 2022)

However, understanding the workings of this market is decisive for stakeholders to make informed decisions. The quality of online education only consider the value of the education (Wen, 2020). According to the literature study, a thorough income analysis of the online education market can offer important insights about the market's size and growth patterns, performance of online education systems, preferences to platforms, Competitive countryside (Samuels, April 2014) (Matthew S. Thiese et. al., 2016) (Shaket Ganeriwal et. al., 2021) (Rosa-María Rodríguez-Jiménez et, 2022) (Şahin, 2020) (Muhammad, 2021) (Ashour, 2024) (Gupta, January,2021). This study aims to provide a detailed income analysis of the online education market, exploring the key aspects and identifying opportunities for growth, innovation, and investment.

It explores a comprehensive overview of the global online education market covering data across 45 countries, focusing on its scope and growth rate from 2017 to 2024, top-performing countries, and the competitive landscape. Building on existing knowledge, this research offers valuable insights for investors and organizations, informs strategic decisions in the online education sector, and enhances understanding of learner behaviour and market trends. Ultimately, the mathematical understanding of this study equips stakeholders with the necessary information to navigate the rapidly evolving online education landscape.

II. RESEARCH METHODOLOGY

This research will contribute to the existing knowledge on the online education market by providing Actionable insights for businesses and investors based on the

strategy decisions for online education industries. This can further enhance understanding of learner’s behavior and market trends.

The study adopts a mixed-methods approach, integrating secondary research and data analysis to give a complete insight of the online education market growth, trends, and future prospects. The data used in this investigation was obtained by the authors and is available through Statista. The study runs across the years 2017 to 2024 using statistical techniques, graphical displays and descriptive analysis. Statista is a reputable market research database and the present dataset provides an eight-year outlook on market trends which is a very valuable time span to study the development of online education portals. (Statista, n.d.)

The purpose of the study is to extract meaningful insights through statistical techniques involving descriptive statistics, normality test and Paired Samples T-Test (Donald W Zimmerman, 1993) to identify patterns and relationships within the data. Additional graphical displays include visualizations such as charts and graphs to facilitate data interpretation and understanding. The descriptive analysis summarizes to provide an overview of the market's key characteristics. The study is designed to include a time frame of 8 substantial years of income growth across the vital years of 2017 to 2024 considering the Pre and Post COVID years of the online education portals. The sample encompasses a global coverage involving a total of 45 countries worldwide.

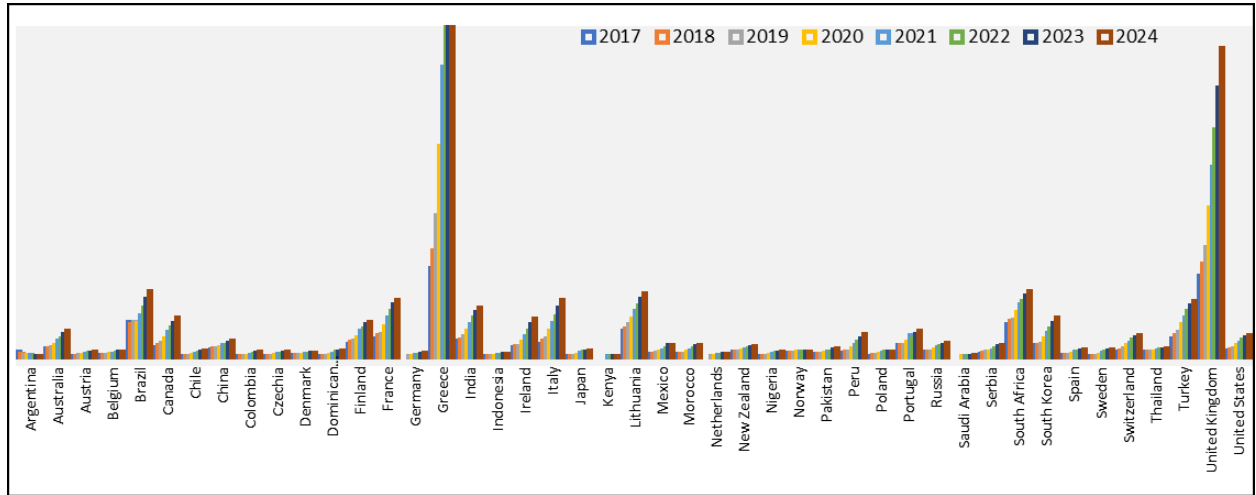


Figure 1: Country wise -Year wise income

The year wise total income of the online education platforms extracted from the Statista website is presented in Table 1. The year-wise average income, mean, median, standard deviation and standard error of the online education platforms are presented in Table 2.

Year-wise income of online education platforms:

Year	N	Mean	Median	Standard Deviation	Standard Error
2017	45	0.11	0.04	0.194	0.0289
2018	45	0.122	0.04	0.224	0.0333
2019	45	0.142	0.05	0.281	0.0419
2020	45	0.189	0.05	0.399	0.0595
2021	45	0.247	0.07	0.533	0.0795
2022	45	0.294	0.09	0.659	0.0983
2023	45	0.349	0.11	0.8	0.1192
2024	45	0.398	0.12	0.925	0.1379

Table 1: Descriptive statistics of income from 2017 to 2024.

Year	2017	2018	2019	2020	2021	2022	2023	2024
Total Income (in bn USD)	21.1	27.7	37.1	50.4	57.0	56.7	57.4	58.49

Table 2: Total Income of online education Platforms from 2017 to 2024

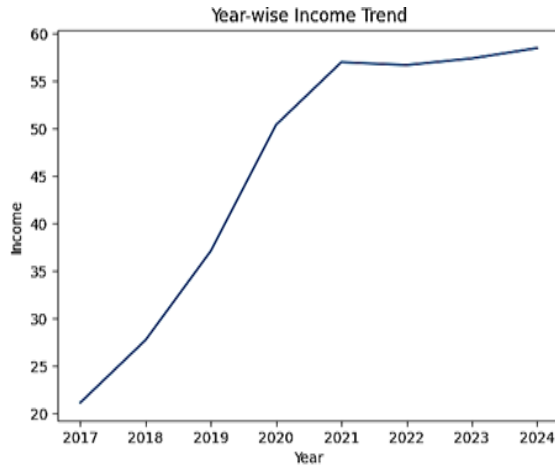


Figure 2: Year-wise total income trend

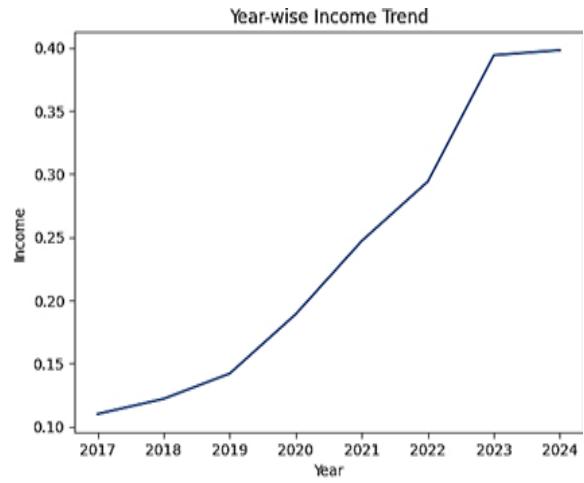


Figure 3: Year-wise average income trend

Figure 2 & Figure 3 depict that over the years, the online education market has demonstrated an exponential income growth trajectory, with expectations of continued scaling in the long run. The growth rate slowed but remained robust in year 2022-2023 with a small increase in income, driven by expanded course offerings and enhanced user experience. Notably, the COVID-19 pandemic has accelerated this growth, with income experiencing a significant uptick from 2019 onwards. The pandemic has catalyzed the online education market's growth, driven by a shift to digital channels, expanded reach and accessibility and an increase adaptability towards online study. The growing income suggests potential for further investment in online education infrastructure.

Table 1, 2 and Figure 2, 3 shows the income of online platforms for the year 2017 to 2024. The average income for the year 2017 was 0.11 and total collection for that year was 21.1. The average income for the year 2018 was 0.122 and total collection for that year was 27.7. The average income for the year 2019 was 0.142 and total collection for that year was 37.1. The average income for the year 2020 was 0.189 and total collection for that year was 50.4. The average income for the year 2021 was 0.247 and total collection for that year was 57.0. The average income for the year 2012 was 0.294 and total collection for that year was 56.7. The average income for the year 2023 was 0.349 and total collection for that year was 57.4. The average income for the year

2024 was 0.398 and total collection for that year was 58.49.

The data shows a consistent increase in the mean values over the eight-year period, with a significant jump between 2020 and 2021. The median values also exhibit a steady increase. The mean values increase steadily from 0.11 in 2017 to 0.398 in 2024, indicating a consistent growth pattern. The standard deviation (SD) values increase substantially over the years, from 0.194 in 2017 to 0.925 in 2024, indicating greater variability in the data. The median values shift from 0.04 in 2017 to 0.12 in 2024, indicating a rightward shift in the data distribution. The standard error (SE) values increase from 0.0289 in 2017 to 0.1379 in 2024, indicating less precision in the estimates. The study involves Normality test for this dataset.

Normality tests are used to determine if a dataset has a normal distribution. For the present dataset, a pairwise normality test is performed on pairs from 2017–2024, 2018–2023, 2019–2022, and 2020–2021 in order to examine the variations over the entire 8 years and 45 countries. Shapiro-Wilk is one of the most explored normality tests over various datasets. Its values range from 0 (non-normal) to 1 (normal). The Kolmogorov-Smirnov normality test is executed on the same dataset, its lower bounds given by 0 (normal) and upper bounds given by 1 (non-normal). Statistic value has been calculated using $\alpha = 0.05$ for the different year pairs.

Year Pair		Normality Test	statistic	p
2017	2024	Shapiro-Wilk	0.351	< .001
		Kolmogorov-Smirnov	0.373	< .001
2018	2023	Shapiro-Wilk	0.347	< .001
		Kolmogorov-Smirnov	0.373	< .001
2019	2022	Shapiro-Wilk	0.353	< .001
		Kolmogorov-Smirnov	0.365	< .001
2020	2021	Shapiro-Wilk	0.37	< .001
		Kolmogorov-Smirnov	0.369	< .001

Table 3: Normality Test

Table 3 and Table 4 shows a significantly non-normal data distribution with a p-value of less than 0.001. It may not be appropriate to use parametric tests that rely on normality. Considering non-parametric test, the means of two related groups are compared by the paired t-test. The paired T test is used to compare two related

groups' means Pre Covid and Post Covid years. The student's t statistics reveals the difference between paired sample means and the degree of freedom is the number of independent observations. In the present case, it has a value of 44. Cohen's d Effect size measures the standardized mean difference.

Table 4: Paired Samples T-Test

Degree of freedom is (N-1) = 44			Differences		95% Confidence Interval		95% Confidence Interval		
Year Pair	Student's t statistic	P	Mean Differences	Standard Error Differences	Lower	Upper	Cohen's d Effect Size	Lower	Upper
2017-2024	-2.58	0.013	-0.2871	0.1111	-0.511	-0.0632	-0.385	-0.686	-0.0802
2018-2023	-2.6	0.013	-0.2276	0.0876	-0.4041	-0.051	-0.387	-0.688	-0.0821
2019-2022	-2.63	0.012	-0.1513	0.0574	-0.2671	-0.0356	-0.393	-0.694	-0.0872
2020 - 2021	-2.85	0.007	-0.0578	0.0203	-0.0987	-0.0169	-0.424	-0.727	-0.1168

III. RESULT AND DISCUSSION

All 95% Confidence Intervals do not include 0, indicating significant differences. $p < 0.05$ indicates that there is a significant difference between year wise income of the online education platforms. Effect Size (Cohen's d) in all comparisons show moderate effect sizes ($|d| \geq 0.38$). These results suggest consistent decreases across of all four comparisons 2017-2024, 2018-2023, 2019-2022, 2020-2021 with moderate effect sizes. A detailed interpretation of each test and comparative is provided as follows:

1. 2017 vs. 2024

$p = 0.013$ which is < 0.05 indicates that there is a significant difference between year wise income of the online education platforms. Mean difference = -0.2871

shows average improvement from years 2017 to 2024. 95% Confidence Interval [-0.511, -0.0632] does not include 0 that is confirming significant difference. Cohen's d = -0.385 show moderate effect size. The result shows significant decrease from 2017 to 2024.

2. 2018 vs. 2023

$p = 0.013$ which is < 0.05 indicates that there is a significant difference between year wise income of the online education platforms in this span of time. Mean difference = -0.2276 shows average improvement from years 2017 to 2024. 95% Confidence Interval [-0.4041, -0.051] does not include 0 that is confirming significant difference. Cohen's d = -0.387 show moderate effect size. The result shows significant decrease from 2018 to 2023.

3. 2019 vs. 2022

$p = 0.012$ which is < 0.05 indicates that there is a significant difference between year wise income of the online education platforms. Mean difference = -0.1513 shows average improvement from years 2017 to 2024. 95% Confidence Interval $[-0.2671, -0.0356]$ does not include 0 that is confirming significant difference. Cohen's $d = -0.393$ show moderate effect size. The result shows significant decrease from 2019 to 2022.

4. 2020 vs. 2021

$p = 0.007$ which is < 0.05 indicates that there is a significant difference between year wise income of the online education platforms. Mean difference = -0.0578 shows average improvement from years 2017 to 2024. 95% Confidence Interval $[-0.0987, -0.0169]$ does not include 0 that is confirming significant difference. Cohen's $d = -0.424$ show moderate effect size. The result shows Significant decrease from 2019 to 2022.

Summary:

The table 4 shows the results of paired samples t-tests comparing the means of two related groups across different years. All four comparisons show statistically significant differences ($p < 0.05$) between the paired groups. The mean differences are negative, indicating a decrease from the earlier year to the later year. Effect sizes (Cohen's d) indicate moderate effects. The mean value in 2024 is significantly lower than in 2017. The mean difference is -0.2871 , indicating a decrease of 0.2871 units.

The data suggests a steady decline or improvement over time. The consistent decreases across multiple comparisons reinforce the reliability of the findings. Moderate effect sizes indicate practical significance, suggesting that the changes are substantial enough to have real-world implications.

IV. CONCLUSION

From the above analysis, it is evident that since 2018, the income of such portals is showing steady growth. But due to COVID 19 pandemics there was a huge rise in income for the online education platforms in various countries along with additional challenges that obstructed the development of such portals offering online courses. The research also revealed that as per paired T test, there is a significant increase in income

year wise especially in 2020-21. From the research, the various educational portals under government and non-government heads may initiate necessary initiative to ensure that the income is continuing to improve over the years. The online education market is expected to continue its upward trajectory, driven by technological innovations, shifting consumer behaviors, and expanding digital payment options. This study provides valuable insights for businessmen, investors, and policymakers seeking to capitalize on this growing market.

The key findings include significant growth from 21.1 bn USD in 2017 to 58.49 bn USD in 2024. The three major leading countries are China, Germany and UK, based on the analysis. A significant dominance of the Asia Pacific region is observed in the market, driven by China's e-commerce growth.

This study acknowledges some limitations such as the study's reliance on secondary data from Statista may introduce limitations in data collection. The study's focus on 2017-2024 may not capture long-term trends or future market shifts. The study's scope is limited to 45 countries. By acknowledging these limitations, this study encourages further research and investigation into the online education market's complexities.

For future research, we need to consider investigating potential causes or factors contributing to the growth rate of online education systems. To better understand the underlying mechanisms or relationships, we must look into additional analysis and thus investigate the effect of trending factors like artificial intelligence and augmented reality on such an educational system. The role of social media and its influence on online educational courses is also noteworthy. Proper collaboration with industry leaders and expansion of the geographical dimensions can lead to better conclusions.

REFERENCES

- [1] Aldhafeeri, F. M. (2022). Effectiveness of digital education shifting model on high school students' engagement. *Education and Information Technologies*, :6869–6891. doi:<https://doi.org/10.1007/s10639-021-10879-4>
- [2] Ashour, L. (2024, March). A review of user-friendly freely-available statistical analysis software for medical researchers and

- biostatisticians. *Research in Statistics*, 2. doi: <https://doi.org/10.1080/27684520.2024.2322630>
- [3] Cabual, R. A. (2022). The Extent of the Challenges in Online Learning during the COVID-19 Pandemic. *Open Access Library Journal*, ISSN: 2333-9721, 9(e8233). doi: 10.4236/oalib.1108233
- [4] Donald W Zimmerman, R. H. (1993). Effect of nonindependence of sample observations on some parametric and nonparametric statistical tests. *Communications in Statistics - Simulation and Computation*, 22(3), 779-789. doi:10.1080/03610919308813123
- [5] Gupta, E. G. (January,2021). Statistical Analysis of E-Learning. *International Journal of Development Research*, 11 (01), 43590-43593. doi:<https://doi.org/10.37118/ijdr.20603.01.2021>
- [6] Haslenda Yusop et at. (2015). The Effectiveness of Excellence Camp: A Study on Paired Sample. (pp. 453 – 461). Elsevier B.V. doi:10.1016/S2212-5671(15)01174-0
- [7] Haslenda Yusop et.al. (2015). The Effectiveness of Excellence Camp: A Study on Paired Sample. *Procedia Economics and Finance*, 453-461. doi:10.1016/S2212-5671(15)01174-0
- [8] Idowu Sulaimon Adeniyi 1, *. N. (2024). E-learning platforms in higher education: A comparative review of the USA and Africa. *International Journal of Science and Research Archive*, 2024, 11(01),, 1686–1697. doi: <https://doi.org/10.30574/ijdra.2024.11.1.0283>
- [9] Idowu Sulaimon Adeniyi et al. (2024). E-learning platforms in higher education: A comparative review of the USA and Africa. *International Journal of Science and Research Archive*, 2024, 11(01),, 1686–1697. doi: <https://doi.org/10.30574/ijdra.2024.11.1.0283>
- [10] Khalil, R. M.-N. (2020). The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students’ perspectives. 22(285). doi:10.1186/s12909-020-02208-z
- [11] Manfei XU et al. (2017). The differences and similarities between two-sample t-test and paired t-test. *Shanghai Arch Psychiatry*, 29(3), 184-188. doi:<http://dx.doi.org/10.11919/j.issn.1002-0829.217070>
- [12] Matthew S. Thiese et. al. (2016). P value interpretations and considerations. *Journal of Thoracic Disease.*, 8(9), 928-931. doi:10.21037/jtd.2016.08.16
- [13] Muhammad, A. A. (2021, July). A Beginners Review of Jamovi Statistical Software for Economic Research. *Dutse International Journal of Social and Economic Research*, 6(9), 109-118.
- [14] Rosa-María Rodríguez-Jiménez et, a. (2022, February). Embodied Learning for Well-Being, Self-Awareness, and Stress Regulation: A Randomized Trial with Engineering Students Using a Mixed-Method Approach. *Education Sciences*, 12(2). doi:<https://doi.org/10.3390/educsci12020111>
- [15] Şahin, M. &. (2020, January). Jamovi: An Easy to Use Statistical Software for the Social Scientist. *International Journal of Assessment Tools in Education*, 6(4), 670–692. doi:<https://doi.org/10.21449/ijate.661803>
- [16] Samuels, P. (April 2014). *Paired Samples t-test*. stcp-gilchristsamuels-7, Birmingham City University. Retrieved from <http://www.statstutor.ac.uk/resources/uploaded/pairedsamplesttest3.pdf>
- [17] Shaket Ganeriwat et. al. (2021, May). Impact of Pre and Post Covid-19 in FMCG sector with reference to Bombay Stock Exchange (BSE). *International Journal of All Research Education and Scientific Methods (IJARESM)*, 9(5), 1515-1524. Retrieved from www.ijaresm.com
- [18] Statista. (n.d.). Retrieved from <https://www.statista.com/>
- [19] Tumurchudur, S. (n.d.). Analysis of Success Factors of E-Learning. *Embedded Selforganising Systems*, 9(4), 34-38. doi:10.14464/ess.v9i4.556
- [20] Wen, J. (2020). Regression Analysis on the Influencing Factors of the Acceptance of Online Education. 25(5), 595-600. doi:<https://doi.org/10.18280/isi.250506>