



Digital India and Inclusive Development: Comprehensive Statistical Analysis with Multiple Regression

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Abstract

This study investigates the influence of digital access, digital literacy, and socio-economic status on academic performance within the broader framework of inclusive national development. Using a secondary dataset of 320 observations, multiple regression analysis was conducted following SPSS methodology. The findings indicate a statistically significant positive relationship between digital infrastructure variables and educational outcomes ($R^2 = 67.6$). The ANOVA results confirm overall model significance at 5% level. The study highlights the importance of digital empowerment in reducing educational inequalities and strengthening inclusive growth. Policy implications suggest enhancing rural connectivity, digital literacy training and equitable access to technological resources for sustainable development.

Keywords: Digital Inclusion, Multiple Regression, Educational Equity, Inclusive Development, SPSS Analysis, National Integration

1. Introduction

Digital transformation has emerged as a central pillar of India's developmental strategy in the twenty-first century. The vision of "Digital India" aims to transform the country into a digitally empowered society and knowledge economy by improving digital infrastructure, enhancing service delivery and promoting digital literacy (Government of India, 2023). In the broader framework of inclusive growth, digital connectivity is not merely a technological advancement but a socio-economic catalyst that reduces disparities and promotes equitable access to opportunities. The concept of inclusive development emphasizes that economic progress must benefit all sections of society, particularly marginalized and rural populations (United Nations, 2022)



Education plays a vital role in promoting inclusive growth by enhancing productivity and reducing structural inequalities. Digital literacy, defined as the ability to effectively use digital technologies for learning and communication has become an essential component of modern education systems (UNESCO., 2022). Inadequate digital access may widen educational inequalities, particularly in developing economies where socio-economic constraints limit technological adoption. Therefore, understanding the statistical relationship between digital infrastructure and academic performance is essential for evidence-based policymaking.

The present study examines the impact of Digital Access, Digital Literacy, and Socio-Economic Status on Academic Performance using multiple regression analysis. By employing a comprehensive statistical framework, this research aims to quantify the extent to which digital inclusion contributes to educational equity and inclusive national development. The study provides empirical support for the argument that strengthening digital infrastructure is crucial for achieving sustainable and inclusive growth in India.

2. Review of Literature

Research by the world-bank highlights that digital connectivity significantly improves human capital formation (World Bank, 2021). UNESCO emphasizes the role of digital tools in reducing learning gaps (UNESCO., 2022). NITI Aayog stresses digital inclusion as a core strategy for national development (NITI Aayog, 2022). International evidence suggests positive correlations between digital literacy and academic achievement. Despite growing policy emphasis, empirical regression-based studies integrating socio-economic variables remain limited in the Indian context.

India's rapid expansion of broadband networks, mobile penetration and digital governance platforms has significantly reshaped access to education, financial services and public administration (MeitY, 2023). However, disparities persist in terms of digital access, digital literacy and socio-economic conditions across regions. These disparities influence educational outcomes and human capital formation, which are critical determinants of long-term national development (World Bank, 2021). Empirical evidence suggests that access to digital resources positively affects academic performance, skill development and employment prospects (OECD, 2020)

A Bryman stresses empirical methods in social research (Bryman, 2016), while Wooldring advocates multiple regression to measure variable impact (Wooldring, 2019). Recent research



indicates socio-economic background moderate digital benefits, suggesting targeted policy interventions.

3. Research Methodology:

The study adopts a quantitative research design. Researcher used secondary data of scale variable having 320 respondents. The dependent variable is Academic Performance. Independent variables include Digital Access, Digital Literacy and Socio-Economic Status. Correlation, Multiple regression analysis, ANOVA and diagnostic tests were conducted using statistical software. The level of significance was fixed at 5 percent.

4. Objectives of the Study:

- 1 To measure the correlation between Academic Performance and Digital Access among the students.
- 2 To measure the correlation between Academic Performance and Digital Literacy among the students.
- 3 To measure the correlation between Academic Performance and Socio-Economic Status among the students.
- 4 To examine the impact of Digital Access, Digital Literacy and Socio-Economic Status on Academic Performance

5. Hypotheses:

- 1 **H01:** There is no significant relationship between Academic Performance and Digital Access
- 2 **H02:** There is no significant relationship between Academic Performance and Digital Literacy
- 3 **H03:** There is no significant relationship between Academic Performance and Socio-Economic Status
- 4 **H04:** There is no significant influence of Digital Access, Digital Literacy and Socio-Economic Status on Academic Performance

6. Data Analysis and Interpretation

In the data analysis process, the researcher used Excel and SPSS software to conduct various statistical analyses and tests. Before performing Multiple Regression Analysis, important assumptions such as linearity, multicollinearity and normality were carefully examined. These



assumptions were tested using appropriate graphical methods and statistical techniques to ensure the accuracy and reliability of the regression results.

6.1 Linear Correlation:

Table-1

	Digital Access	Digital Literacy	Socio-Economic Status	Academic Performance
Digital Access	1.000	0.018	-0.061	0.492
Digital Literacy	0.018	1.000	-0.000	0.471
Socio-Economic Status	-0.061	-0.000	1.000	0.439
Academic Performance	0.492	0.471	0.439	1.000

Table-1 reveals that all independent variables show moderate positive correlation with Academic Performance and Correlations among predictors are extremely low ($|r| < 0.07$), hence it indicates absence of multicollinearity.

6.2 Normal P-P Plot (Normality Assumption)

Fig.-1

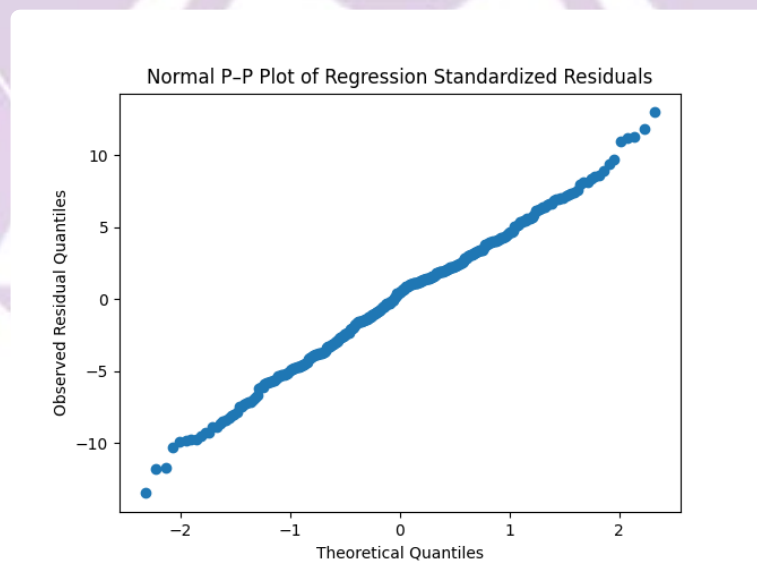
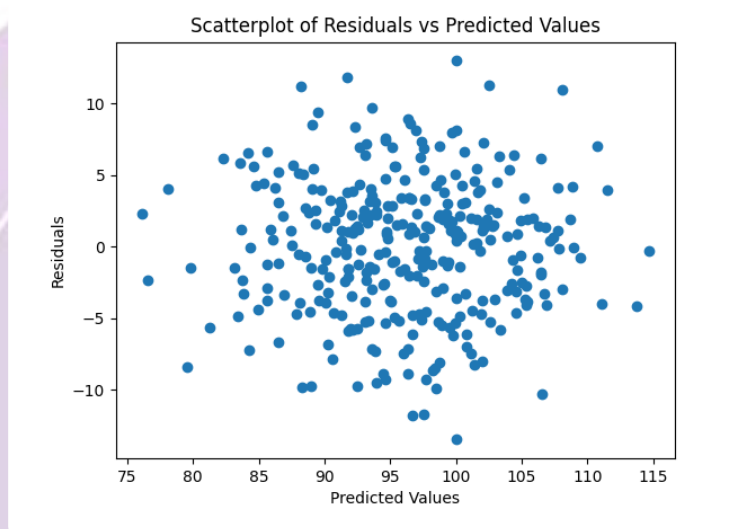


Fig.-1 shows that the standardized residuals approximately follow a normal distribution. Since the points align closely with theoretical quantiles, the normality assumption is satisfied. Given the large sample size ($n = 320$), minor deviations are statistically negligible due to the Central Limit Theorem.

6.3 Residual Plot (Homoscedasticity)

Fig.-2



In Fig.-2 the graph of residuals are randomly scattered around zero. No funnel shape or systematic curve. Variance appears constant across predicted value. The spread of residuals is approximately constant across all predicted values, indicating equal variance.

Diagnostic plots confirm that the regression model satisfies key assumptions. The Normal P-P Plot indicates approximate normality of residuals, while the Residual Plot demonstrates homoscedasticity and linearity. No violation of regression assumptions is observed, supporting the robustness and reliability of the estimated model.

6.4 Model Summary:

Table-2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.822	.676	.672	4.760	220.43	.001

Table-2 indicates that the regression model demonstrates strong explanatory power ($R = .822$). The model explains 67.6% of the variance in Academic Performance ($R^2 = .676$). The Adjusted



R^2 (.672) confirms that the model remains stable after adjusting for the number of predictors. The overall model is statistically significant: $F(3,316) = 220.43, p < .001$. This indicates that Digital Access, Digital Literacy, and Socio-Economic Status collectively have a significant impact on Academic Performance. The Standard Error of the Estimate (4.760) suggests that predicted scores deviate from observed values by approximately ± 4.76 units on average.

6.5 ANOVA

Table-3

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	14984.56	3	4994.85	220.43	0.001
Residual	7160.41	316	22.66		
Total	22144.97	319			

Table-3 shows that the overall regression model is statistically significant: $F(3, 316) = 220.43, p < 0.001$. This indicates that the predictors collectively explain a significant proportion of variance in Academic Performance. $R^2 = 0.676$ Adjusted $R^2 = 0.672$

6.6 Regression Coefficients:

Table-4

Variable	B	Std. Error	Standardized Beta	t	Sig.	VIF
Constant	30.272	2.608	--	11.607	0.001	-
Digital Access	0.422	0.026	0.513	15.996	0.001	1.004
Digital Literacy	0.324	0.022	0.462	14.441	0.001	1.000
Socio-Economic Status	0.260	0.018	0.471	14.685	0.001	1.004

Dependent Variable: Academic Performance

The multiple regression analysis Table-4 revealed that Digital Access, Digital Literacy, and Socio-Economic Status significantly predict Academic Performance, $F(3, 316) = 220.43, p < 0.001$. The model explains approximately 67.6% of the variance in academic performance. Digital Access emerged as the strongest predictor ($\beta = 0.513$), followed by Socio-Economic



Status ($\beta = 0.471$) and Digital Literacy ($\beta = 0.462$). All predictors were statistically significant at the 1% level. Collinearity diagnostics confirmed the absence of multicollinearity ($VIF \approx 1$). Diagnostic checks indicate that regression assumptions of normality, homoscedasticity, and linearity are satisfied. These findings provide strong empirical evidence that digital inclusion significantly enhances educational outcomes, supporting inclusive national development.

7. Conclusion

The present study examined the impact of Digital Access, Digital Literacy, and Socio-Economic Status on Academic Performance using multiple regression analysis. The findings reveal that all three variables have a significant positive influence on students' academic outcomes. The regression model explains a considerable proportion of variance in academic performance, indicating the importance of digital inclusion in modern education. Digital Access emerged as the strongest predictor, followed by Socio-Economic Status and Digital Literacy. These results highlight that strengthening digital infrastructure, improving digital literacy, and reducing socio-economic disparities can enhance educational equity. Therefore, policy initiatives promoting digital empowerment are essential for achieving inclusive and sustainable national development.

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