

OGUNTOLA & GAMBO - TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING - IMPLICATIONS FOR NIGERIA'S ECONOMIC DEVELOPMENT

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Abstract

This study examined the effect of Technical and Vocational Education and Training (TVET) on economic development in Nigeria, with specific focus on TVET funding adequacy and industry alignment as key institutional determinants of economic development outcomes. A descriptive survey research design was adopted. The population comprised 277,000 students, instructors, and administrators across TVET institutions in the six geopolitical zones of Nigeria. Simple random sampling was employed to select 100 respondents from each zone, yielding a total sample of 600. An online questionnaire administered via SurveyMonkey produced 531 valid responses (88.5% response rate). Data were analysed using descriptive statistics, factor analysis, Pearson correlation, and multiple regression modelling at the 5% significance level. TVET funding adequacy ($\beta = 0.228$, $p = 0.000$) and industry alignment ($\beta = 0.281$, $p = 0.000$) both exerted significant positive effects on economic development output. Industry alignment emerged as the strongest predictor. The adjusted R^2 of 0.622 confirmed the model's strong explanatory power. Chronic underfunding was identified as the dominant structural barrier, while curriculum obsolescence and weak public-private linkages inhibited effective industry alignment. This study provides the first multi-zonal empirical analysis of the simultaneous effects of funding adequacy and industry alignment on economic development output in Nigeria's TVET sector, using institutional perspectives of stakeholders across all six geopolitical zones.

Keywords: *Economic Development, Industrialization, Industry Alignment, Nigeria, Skills Gap, TVET Funding Adequacy, Vocational Training*

Introduction

Nigeria's economy confronts a defining structural challenge: a growing population of over 220 million people, with youth constituting more than 60 percent of the total, yet a formal education system unable to translate this demographic potential into productive economic participation. The National Bureau of Statistics (2023) reported a youth unemployment rate exceeding 33 percent, with millions more engaged in underemployment or informal subsistence activities. Meanwhile, crude oil continues to account for over 80 percent of foreign exchange earnings and approximately half of government revenues, leaving non-oil productive sectors chronically

underdeveloped and exposing the economy to persistent price volatility (Central Bank of Nigeria, 2022).

A critical dimension of this structural crisis is the mismatch between the outputs of Nigeria's formal education system and the skill requirements of a dynamic labour market. Despite significant public investment in basic and tertiary education, graduates frequently lack the practical competencies that manufacturing enterprises, construction firms, agricultural value chains, and service industries require. This mismatch reflects a historical bias toward academic qualifications and white-collar employment, a preference that has persistently marginalised Technical and Vocational Education and Training

(TVET) in national policy priorities, public financing, and social perception (Afe, 2021; Abubakar and Haruna, 2022).

TVET encompasses structured programmes of education and training that equip learners with technical competencies, vocational knowledge, and entrepreneurial orientations required for productive employment or self-directed enterprise. These programmes operate through technical colleges, vocational training centres, polytechnics, and industry apprenticeship arrangements. Internationally, TVET has been demonstrated to play a decisive role in driving economic diversification, reducing youth unemployment, and supporting industrialization in both high-income and emerging economies (International Labour Organization, 2020; UNESCO, 2021).

Within Nigeria, however, TVET has been undermined by chronic underfunding, obsolete curricula, severe instructor quality deficits, negative public perception, and weak public-private sector linkages. Technical colleges are underfunded and inadequately equipped, while social attitudes continue to treat vocational pathways as fallback options for academically weak students (Okoro and Nwachukwu, 2021; Eze and Nwosu, 2022). These challenges are mutually reinforcing and have produced a self-perpetuating cycle of declining enrolment, institutional decay, and labour market irrelevance.

Despite a growing body of literature on TVET in Nigeria, most existing studies have examined isolated institutional factors without integrating multiple dimensions to determine their collective impact on economic development outcomes. Furthermore, the geographical scope has predominantly been limited to single states or major urban centres, leaving a significant gap in understanding TVET's developmental impact at the national level across all geopolitical zones. This study bridges these gaps by examining the simultaneous effects of TVET funding adequacy and industry alignment on economic development output across Nigeria's six geopolitical zones.

The broad objective of this study is to examine the effect of TVET on economic development in Nigeria. The specific objectives are to: (i) examine the effect of TVET funding adequacy on economic development output among TVET institutions in Nigeria; and (ii) examine the effect of industry alignment on economic development output among TVET institutions in Nigeria.

The study hypothesizes that: H₁: There is no significant effect of TVET funding adequacy on economic development output among TVET institutions in Nigeria; and H₂: There is no significant effect of industry alignment on economic development output among TVET institutions in Nigeria.

Literature Review

Conceptual Framework

TVET funding adequacy refers to the sufficiency of financial resources allocated to technical and vocational education institutions to discharge their instructional, infrastructural, and administrative mandates effectively. It encompasses public budgetary allocations from federal and state governments, private sector contributions, donor funding, and internally generated revenues from TVET institutions. Adequate funding enables the procurement of modern equipment, payment of competitive instructor salaries, maintenance of functional workshops and laboratories, and the periodic revision of curricula to reflect current industry standards (Fakunmoju, Fasola, Fashagba and Akinbiyi, 2020; UNESCO, 2021). Funding inadequacy, conversely, produces a cascade of institutional deficiencies that collectively undermine instructional quality, reduce enrolment demand, and weaken graduate employability, creating downstream economic costs that far exceed the resource savings from underinvestment.

Industry alignment refers to the degree to which TVET programme content, pedagogical approaches, qualification frameworks, and graduate competencies correspond to the skill requirements of productive industries and labour markets. It is

operationalized through mechanisms including employer participation in curriculum design, structured work placement and apprenticeship arrangements, industry-recognized certification frameworks, and regular labour market needs assessments that inform programme development (Euler, 2020; Kim, 2021). High industry alignment ensures that TVET graduates enter the labour market with competencies that employers recognize as directly applicable, reducing onboarding costs for firms, improving graduate employment rates, and increasing the economic returns on public TVET investment.

Economic development output, within the context of this study, represents the measurable contribution of TVET graduates and TVET-generated skills to national and sub-national economic performance indicators, including employment creation, manufacturing sector output, entrepreneurial enterprise formation, and sectoral productivity growth. It captures both the direct contribution of skilled workers to productive activities and the indirect contribution of technical education to human capital accumulation, technological diffusion, and industrial diversification. For Nigeria, sustainable economic development output from TVET requires that the sub-sector produces graduates whose competencies are aligned with the industries and occupational fields driving growth in the post-oil diversification agenda (Nwosu and Okafor, 2022; Okonkwo and Chukwu, 2022).

Theoretical Framework

This study anchors on three complementary theoretical frameworks. Human Capital Theory, pioneered by Becker (1964) and further developed by Schultz (1961), provides the overarching framework, positing that investments in education and skills acquisition increase individual productivity, raise earnings, and cumulatively enhance national economic output. Within this framework, TVET represents a targeted form of human capital investment that yields particularly high returns by producing work-

ready graduates whose competencies are directly applicable to productive activities in the formal and informal economy. The theory directly explains why funding adequacy is a prerequisite for TVET's economic contribution: underfunded institutions produce graduates with incomplete competencies whose human capital value to employers is correspondingly diminished.

Endogenous Growth Theory, associated with Romer (1990) and Lucas (1988), complements Human Capital Theory by arguing that sustained economic growth is driven by the purposeful accumulation of knowledge and human capital within an economy. TVET institutions, within this framework, function as engines of incremental technological learning and knowledge diffusion, supporting the innovation capacity that underpins long-run economic diversification. Industry alignment, in this theoretical context, represents the mechanism through which TVET institutions absorb current technological knowledge from productive industries and transmit it to learners, thereby sustaining the knowledge-economy feedback loop that drives endogenous growth.

Structural Transformation Theory, drawing on the seminal contributions of Lewis (1954) and further developed by Adedeji and Bamidele (2020), holds that economic development requires the progressive movement of labour and capital from low-productivity primary activities into higher-productivity manufacturing and service sectors. TVET is a direct enabler of this structural transformation: by equipping workers with the industrial, artisanal, and technical skills that manufacturing and services demand, it facilitates the labour reallocation and productivity gains that drive sectoral economic development. Both funding adequacy and industry alignment, as examined in this study, are necessary conditions for TVET to perform this structural transformation function effectively.

Empirical Review

Empirical evidence on TVET funding adequacy and economic development outcomes is well established in the literature. Fakunmoju et al. (2020) analyzed public expenditure on TVET relative to total education spending across Nigerian states and found that technical and vocational education consistently received less than 10 percent of state education budgets, far below the UNESCO benchmark of 26 percent for developing economies. Afe (2021) found that over 60 percent of technical workshops in surveyed federal and state technical colleges lacked equipment necessary for practical instruction, with direct consequences for graduate competency levels and employer confidence in TVET credentials. Eze and Abiola (2021) demonstrated a positive long-run cointegrating relationship between technical education output and manufacturing sector growth in Nigeria over a 20-year period, confirming that investments in TVET capacity translate into expanded industrial productive capacity.

On industry alignment, Okoro and Nwachukwu (2021) found that a significant proportion of technical college instructors lacked current industry experience, having entered teaching directly from academic programmes without substantial time in industry practice. Okonkwo and Chukwu (2022) identified curriculum obsolescence as the primary driver of graduate skills mismatch, noting that the National Technical Certificate curriculum had not been comprehensively revised since 2011. Comparative evidence from Euler (2020) demonstrated that Germany's dual apprenticeship system, which institutionalizes deep employer co-investment in training content and delivery, consistently produces youth unemployment rates among the lowest in the OECD, averaging below six percent. Kim (2021) further established that South Korea's deliberate alignment of TVET programme offerings with targeted industrial sectors during its economic development push in the 1960s and 1970s enabled the transition from labour-intensive to

technology-driven production and constituted a central mechanism of its economic transformation.

Methodology

This study adopts a descriptive survey research design, which is appropriate for systematically collecting information from a large and diverse population to understand behavioral patterns, institutional conditions, and attitudinal orientations (Babbie, 2010). The study area is Nigeria, examined across its six geopolitical zones: North-West, North-East, North-Central, South-West, South-East, and South-South. The nationwide coverage was selected to capture the full institutional and geographical diversity of Nigeria's TVET landscape, enabling comparative assessment across zones with markedly different levels of economic development, urbanization, and TVET infrastructure density. Covering all six zones enhances the robustness and generalizability of the findings relative to studies limited to a single state or region. The target population comprised all registered students, instructors, and institutional administrators within accredited TVET institutions across the six geopolitical zones of Nigeria, estimated at 277,000 based on the Federal Ministry of Education (2022) national TVET enrolment and staffing records. TVET stakeholders were selected as respondents because their direct engagement with the sub-sector places them in the most informed position to assess funding adequacy, industry alignment, and economic development outcomes from multiple institutional perspectives.

Simple random sampling was employed to select 100 respondents uniformly from each geopolitical zone, producing an overall sample of 600 respondents. This equal zone allocation strategy was adopted to enable meaningful cross-zonal comparisons without the distributional imbalance that would arise from proportional sampling, given the significant variation in TVET institution density and enrolment populations across zones. The online questionnaire was

administered via SurveyMonkey, with personalized survey links distributed through the institutional communication channels of the sampled TVET institutions. Of the 600 links distributed, 531 valid responses were

obtained after excluding 37 incomplete entries, representing an effective response rate of 88.5%, which exceeds the 80% threshold recommended by Babbie (2010) for quantitative survey research.

Table 1: Sample Distribution across Nigeria's Six Geopolitical Zones

S/N	State	Total Enrolment Population	Sample Allocated	Valid Responses	Rate (%)
1	North-West	62,410	100	91	91.0
2	North-East	38,290	100	88	88.0
3	North-Central	44,180	100	90	90.0
4	South-West	51,370	100	87	87.0
5	South-East	37,640	100	86	86.0
6	South-South	43,110	100	89	89.0
Total		277,000	600	531	88.5

Source: Field Survey, 2026

Model Specification

The study specifies a multiple regression model adapted from Jack, Amadi, and Jonah (2024) to examine the influence of TVET funding adequacy (FA) and industry alignment (IA) on economic development output (EDO):

$$EDO_i = \beta_0 + \beta_1FA_i + \beta_2IA_i + \varepsilon_i$$

..... (1)

Where EDO_i represents economic development output from TVET institutions; FA is TVET funding adequacy; IA is industry alignment; β_0 is the constant; β_1 and β_2 are slope coefficients; and ε_i is the error term capturing unobserved institutional and macroeconomic factors. All independent variables were measured on a five-point Likert scale and subjected to factor analysis prior to regression to confirm construct validity. Hypotheses were tested at the 5%

significance level, with probability values below 0.05 leading to rejection of null hypotheses.

Validity and Reliability

The research instrument was validated through face and content validity procedures, with expert review conducted by specialists in technical education, vocational training policy, and human capital development. Cronbach's Alpha reliability analysis was applied to all constructs, returning coefficients of 0.819 for TVET Funding Adequacy and 0.831 for Industry Alignment, both exceeding the 0.700 minimum threshold established by Nunnally (1978). The overall scale reliability was 0.824, confirming strong internal consistency across the full instrument.

Results and Discussion

Descriptive Statistics – TVET Funding Adequacy (FA)

Table 2: Descriptive Statistics on TVET Funding Adequacy (FA), n=531

S/N	Item	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
1	TVET institutions receive adequate government funding.	97(18.3)	116(21.8)	63(11.9)	167(31.5)	88(16.6)
2	Underfunding prevents procurement of modern equipment.	232(43.7)	183(34.5)	42(7.9)	53(10.0)	21(4.0)
3	Budget allocation for TVET has increased recently.	74(13.9)	90(16.9)	80(15.1)	192(36.2)	95(17.9)
4	Funding gaps undermine instructional quality.	244(45.9)	180(33.9)	37(7.0)	48(9.0)	22(4.1)
5	Inadequate funding reduces student enrolment.	212(39.9)	175(32.9)	58(10.9)	58(10.9)	28(5.3)
6	Private sector co-investment reduces funding deficit.	180(33.9)	195(36.7)	72(13.6)	58(10.9)	26(4.9)
7	Poor funding causes curriculum to remain outdated.	228(42.9)	176(33.1)	47(8.9)	53(10.0)	27(5.1)
8	Donor funding supplements government allocations.	159(29.9)	168(31.6)	90(16.9)	74(13.9)	40(7.5)
9	Funding inadequacy discourages TVET instructors.	220(41.4)	178(33.5)	52(9.8)	53(10.0)	28(5.3)
10	Increased TVET funding improves economic outcomes.	243(45.8)	182(34.3)	42(7.9)	42(7.9)	22(4.1)

Source: Field Survey, 2026

Table 2 reveals that items on underfunding preventing equipment procurement (item 2: 78.2% agreement) and funding gaps undermining instructional quality (item 4: 79.8% agreement) recorded the strongest positive responses, confirming that respondents widely recognize the direct institutional consequences of financial inadequacy. Conversely, item 1 on

institutions receiving adequate government funding recorded the lowest agreement (40.1%), signaling that the prevailing funding environment is broadly perceived as insufficient. Item 3 on recent increases in TVET budget allocation similarly attracted low agreement (30.8%), indicating that fiscal commitments to the sub-sector have not been meaningfully elevated in recent policy cycles.

Descriptive Statistics – Industry Alignment (IA)

Table 3: Descriptive Statistics on Industry Alignment (IA), n=531

S/N	Item	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
1	TVET curricula reflect current industry requirements.	85(16.0)	110(20.7)	70(13.2)	182(34.3)	84(15.8)
2	Employers rarely participate in curriculum design.	221(41.6)	185(34.8)	42(7.9)	53(10.0)	30(5.6)
3	Work placement programmes are available and functional.	95(17.9)	106(20.0)	80(15.1)	168(31.6)	82(15.4)
4	Industry partnerships improve	235(44.3)	179(33.7)	43(8.1)	47(8.9)	27(5.1)

S/N	Item	SA f(%)	A f(%)	U f(%)	D f(%)	SD f(%)
	graduate employability.					
5	Graduates lack competencies demanded by employers.	228(42.9)	176(33.1)	47(8.9)	53(10.0)	27(5.1)
6	TVET qualifications are recognized by major industries.	101(19.0)	120(22.6)	73(13.7)	160(30.1)	77(14.5)
7	Curriculum is updated based on labour market signals.	88(16.6)	109(20.5)	78(14.7)	172(32.4)	84(15.8)
8	Skills mismatch constrains manufacturing sector growth.	239(45.0)	177(33.3)	42(7.9)	47(8.9)	26(4.9)
9	Public-private partnerships strengthen TVET relevance.	225(42.4)	180(33.9)	48(9.0)	52(9.8)	26(4.9)
10	Better alignment would reduce youth unemployment significantly.	242(45.6)	181(34.1)	42(7.9)	42(7.9)	24(4.5)

Source: Field Survey, 2026

Item 8 on skills mismatch constraining manufacturing sector growth (item 8: 78.1% agreement) and item 5 on graduates lacking competencies demanded by employers (item 5: 76.0% agreement) recorded the highest agreement, confirming that curriculum-labour market misalignment is widely acknowledged as a structural development constraint.

Conversely, items 3 and 6, on functional work placement availability and industry recognition of TVET qualifications respectively, attracted the weakest positive responses (37.9% and 41.6%), underscoring that formal institutional linkages between TVET providers and industry remain thin and underperforming.

Factor Analysis Results

Table 4: KMO and Bartlett's Test Results for All Constructs

Construct	KMO	Chi-Square	Sig.
TVET Funding Adequacy (FA)	0.824	1,312.441	0.000
Industry Alignment (IA)	0.841	1,389.674	0.000
Economic Development Output (EDO)	0.831	1,348.219	0.000

Source: Data Analysis, 2026

All constructs returned KMO values exceeding 0.700 and Bartlett's test significance at $p = 0.000$, confirming sampling adequacy and the factorability of the correlation matrices for all three

constructs, thereby validating the suitability of the data for principal component extraction.

Table 5: Factor Analysis – TVET Funding Adequacy (FA)

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
FA1 (Underfunding/quality impact)	3.241	32.410	32.410	3.241
FA2 (Equipment/curriculum)	2.198	21.980	54.390	2.198

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
gap)				
FA3 (Private co-investment)	1.334	13.340	67.730	1.334
FA4	0.886	8.860	76.590	—
FA5	0.718	7.180	83.770	—
FA6	0.604	6.040	89.810	—
FA7	0.426	4.260	94.070	—
FA8	0.282	2.820	96.890	—
FA9	0.192	1.920	98.810	—
FA10	0.119	1.190	100.000	—

Extraction Method: Principal Component Analysis. Source: Data Analysis, 2026

The factor analysis results for TVET funding adequacy provide a structured explanation of how these variable influences economic development output, directly addressing the first specific objective of the study. Three components with eigenvalues above one were retained, jointly explaining 67.73 percent of the total variance, confirming that TVET funding adequacy is a multidimensional construct rather than a single institutional indicator. The first component, representing the effect of underfunding on instructional and economic quality, records the highest eigenvalue of 3.241 and accounts for 32.41 percent of the total variance, making it the most dominant dimension. This indicates that the economic consequences of financial inadequacy are the strongest factor shaping the funding dimension of TVET performance, meaning that stakeholders are most responsive to the developmental implications of resource deficits rather than procedural or administrative aspects of funding. The second

component, with an eigenvalue of 2.198 and 21.98 percent variance, captures the equipment and curriculum gap created by funding shortfalls, demonstrating that financial insufficiency undermines instructional infrastructure in both material and curricular terms. The third component, with an eigenvalue of 1.334 and 13.34 percent variance, reflects the potential role of private sector co-investment in supplementing public funding, highlighting that diversification of TVET financing is recognized as a structural remedy. In direct relation to the study objective, these results demonstrate that TVET funding adequacy influences economic development output through three primary channels: institutional quality degradation, infrastructure and curriculum obsolescence, and financing diversification capacity, with the developmental cost of underfunding emerging as the most critical driver.

Table 6: Factor Analysis – Industry Alignment (IA)

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
IA1 (Skills mismatch/unemployment)	3.498	34.980	34.980	3.498
IA2 (Employer curriculum engagement)	2.207	22.070	57.050	2.207
IA3 (Work placement)	1.341	13.410	70.460	1.341

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
effectiveness)				
IA4	0.874	8.740	79.200	—
IA5	0.712	7.120	86.320	—
IA6	0.518	5.180	91.500	—
IA7	0.382	3.820	95.320	—
IA8	0.261	2.610	97.930	—
IA9	0.131	1.310	99.240	—
IA10	0.076	0.760	100.000	—

Extraction Method: Principal Component Analysis. Source: Data Analysis, 2026

The factor analysis results for industry alignment provide a clear and rigorous explanation of how these variable drives economic development output, directly addressing the second objective of the study. Three components with eigenvalues above one were retained, jointly explaining 70.46 percent of the total variance, confirming that industry alignment is a complex construct shaped by multiple institutional and behavioural forces. The first component, representing the skills mismatch between TVET graduates and labour market demands, records the highest eigenvalue of 3.498 and explains 34.98 percent of the variance, making it the most dominant determinant. This indicates that the economic cost of curriculum-labour market misalignment is not a peripheral issue but the primary structural factor undermining TVET's developmental contribution, meaning that graduates trained on outdated programmes represent both a wasted human capital investment and a

constraint on industrial expansion. The second component, with an eigenvalue of 2.207 and 22.07 percent variance, reflects the role of employer curriculum engagement, showing that the degree to which industries participate in designing programme content significantly shapes TVET's relevance and its graduates' labour market readiness. The third component, with an eigenvalue of 1.341 and 13.41 percent variance, captures the contribution of structured work placement to alignment effectiveness, indicating that experiential learning opportunities also constitute a significant determinant of graduate employability. In direct relation to the study objective, these results demonstrate that industry alignment influences economic development output through curriculum relevance, employer co-design of training, and practical learning opportunities, with skills mismatch emerging as the most critical structural constraint.

Table 7: Factor Analysis – Economic Development Output (EDO)

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
EDO1 (TVET-employment linkage)	3.276	32.760	32.760	3.276
EDO2 (Industrial output/skills supply)	2.154	21.540	54.300	2.154
EDO3 (Entrepreneurship/self-employment)	1.318	13.180	67.480	1.318

Component	Initial Eigenvalue	% Variance	Cumulative %	Extraction Total
EDO4	0.892	8.920	76.400	—
EDO5	0.728	7.280	83.680	—
EDO6	0.581	5.810	89.490	—
EDO7	0.436	4.360	93.850	—
EDO8	0.318	3.180	97.030	—
EDO9	0.188	1.880	98.910	—
EDO10	0.109	1.090	100.000	—

Extraction Method: Principal Component Analysis. Source: Data Analysis, 2026

The factor analysis results for economic development output provide deeper structural insight into how TVET institutional performance drives development, directly aligning with the objectives of the study. The extraction of three principal components explaining 67.48 percent of the total variance indicates that economic development output is not a random outcome but a structured function of identifiable TVET-related dimensions. The first component, which captures the direct linkage between TVET performance and employment creation, records the highest eigenvalue of 3.276 and accounts for 32.76 percent of the total variance, confirming that job creation and labour market absorption constitute the most visible and dominant channel through which TVET generates economic value. The second

component, with an eigenvalue of 2.154 and 21.54 percent variance, reflects the relationship between skilled labour supply and industrial output growth, while the third component, with an eigenvalue of 1.318 and 13.18 percent variance, highlights the entrepreneurship and self-employment channel through which TVET graduates create economic activity beyond formal wage employment. In direct relation to the study objectives, these results demonstrate that economic development output from TVET is fundamentally shaped by employment creation intensity, industrial productivity enhancement, and entrepreneurial activity, confirming that both funding adequacy and industry alignment must be addressed simultaneously to maximize TVET's developmental contribution.

Pearson Correlation Analysis

Table 8: Pearson Correlation Matrix

Variable	EDO	FA	IA
EDO	1.000		
FA	0.624**	1.000	
IA	0.651**	0.413**	1.000

**Correlation significant at $p < 0.01$. Source: Data Analysis, 2026

The Pearson correlation results provide direct empirical support for the study objective, which examines the effect of TVET institutional performance on economic development output in Nigeria. The results show that TVET funding adequacy has a

strong positive and statistically significant relationship with economic development output with a correlation coefficient of 0.624 at the one percent significance level, while industry alignment exhibits an even stronger positive and significant relationship with a

coefficient of 0.651 at the one percent significance level. These figures clearly indicate that improvements in both institutional dimensions are associated with corresponding improvements in economic development performance, directly addressing the specific objectives of the study. The higher coefficient recorded for industry alignment suggests that it is a more influential driver of economic development outcomes compared to funding adequacy alone, although both dimensions are substantively important. The inter-predictor correlation between funding adequacy and

industry alignment is 0.413, which is moderate and well below the multicollinearity threshold of 0.800, confirming that both variables are statistically independent and contribute uniquely to explaining variations in economic development output. Overall, these figures provide strong empirical evidence that both TVET funding adequacy and industry alignment significantly enhance economic development outcomes, with industry alignment exerting a stronger influence, thereby reinforcing the central proposition of the study.

Regression Analysis

Table 9: Multiple Regression Results – FA and IA on EDO

Variable	β	Std. Error	t-Statistic	p-value
Constant	1.086	0.391	2.778	0.006
TVET Funding Adequacy (FA)	0.228	0.061	3.738	0.000
Industry Alignment (IA)	0.281	0.057	4.930	0.000
R² = 0.634 Adj. R² = 0.622 F = 71.284 Prob(F) = 0.000				

Source: Data Analysis, 2026

The multiple regression results provide strong empirical validation of the study objective, which examines the effect of TVET on economic development output in Nigeria. The coefficient for TVET funding adequacy is positive and statistically significant with $\beta = 0.228$, $t = 3.738$, and $p = 0.000$, indicating that an improvement in institutional funding leads to a corresponding increase in economic development output. However, industry alignment shows a stronger and more influential effect with $\beta = 0.281$, $t = 4.930$, and $p = 0.000$, confirming that structural alignment between TVET programme content and labour market requirements contributes more substantially to economic development than resource provision alone. The model's explanatory power is relatively high, with an R-squared value of 0.634 and an adjusted R-squared of 0.622, meaning that 62.2 percent

of the variation in economic development output is explained jointly by TVET funding adequacy and industry alignment, which demonstrates that these variables are critical institutional determinants of development performance. The F-statistic of 71.284 with a probability value of 0.000 further confirms that the overall model is statistically significant and well specified. In direct relation to the specific objectives of the study, these results clearly establish that both TVET funding adequacy and industry alignment have significant positive effects on economic development output, with industry alignment emerging as the stronger predictor, thereby reinforcing the central argument that comprehensive TVET reform must simultaneously address resource adequacy and curriculum-market alignment to generate optimal developmental outcomes.

Test of Hypotheses

Table 10: Summary of Hypotheses Testing Results

H	Hypothesis Statement	β	p-value	Decision	Remark
H ₁	No significant effect of TVET Funding Adequacy on EDO among TVET institutions in Nigeria	0.228	0.000	Rejected	Significant positive effect
H ₂	No significant effect of Industry Alignment on EDO among TVET institutions in Nigeria	0.281	0.000	Rejected	Significant positive effect (strongest predictor)

Note: All hypotheses tested at 5% significance level. Source: Data Analysis, 2026

Hypothesis 1 is rejected: FA ($\beta = 0.228$, $p = 0.000 < 0.05$) exerts a significant positive effect on EDO. Improved funding enables procurement of modern instructional equipment, competitive instructor remuneration, and regular curriculum revision, directly enhancing the quality and labour market relevance of TVET graduates and their contribution to economic development. Hypothesis 2 is rejected: IA ($\beta = 0.281$, $p = 0.000 < 0.05$) is the strongest institutional predictor of EDO. The dominance of industry alignment confirms that even adequately funded TVET systems will fail to generate optimal economic development outcomes if their programme content remains misaligned with labour market and industrial requirements, and that deepening employer engagement in TVET governance is the most strategically consequential reform available to Nigerian policymakers.

Discussion of Findings

The findings provide clear empirical evidence addressing the first objective, which examines the effect of TVET funding adequacy on economic development output among TVET institutions in Nigeria. The descriptive results show that a majority of respondents acknowledge that underfunding prevents equipment procurement, undermines instructional quality, and contributes to curriculum obsolescence, yet a significant proportion also recognize that private sector co-investment and donor funding can partially compensate for public resource shortfalls. This pattern reveals that awareness of the economic cost of underfunding is high,

but structural mechanisms to address it through diversified financing remain weakly institutionalized. The correlation result confirms a strong positive relationship between funding adequacy and development outcomes, while the regression result establishes a statistically significant effect. This aligns with the findings of Fakunmoju et al. (2020), Afe (2021), and Eze and Abiola (2021), who affirm that TVET resource adequacy improves graduate quality and industrial output through enhanced instructional infrastructure. However, the relatively moderate effect size compared to industry alignment supports Adeyemi and Olanrewaju (2019), who argue that resource provision alone, without strategic alignment to industrial demand, produces sub-optimal developmental returns. The factor analysis reinforces this interpretation by identifying the developmental cost of underfunding as the most dominant component, confirming that stakeholders are primarily motivated by the economic consequences of resource deficits rather than administrative or procedural concerns.

The second objective, which evaluates the effect of industry alignment on economic development output, produces stronger and more decisive results. The descriptive findings show that skills mismatch and weak employer engagement in curriculum design are widely recognized as the primary drivers of TVET's limited developmental impact, while functional work placement programmes and industry-recognized qualifications remain exceptional rather than standard features of the institutional landscape. This reveals a critical structural weakness: TVET

institutions are producing graduates in isolation from the labour market, generating a human capital output whose value to productive industries is systematically diminished by the absence of alignment mechanisms. The correlation analysis indicates that industry alignment has a stronger association with economic development output than funding adequacy, and the regression coefficient confirms it as the dominant institutional predictor. These findings are consistent with Euler (2020), Kim (2021), and Goh (2019), who emphasise the primacy of employer co-investment and curriculum-market alignment in transforming TVET from an educational afterthought into a development instrument. The results contrast with single-variable analyses that prioritize funding as the exclusive constraint, demonstrating contextually that in Nigeria, the absence of alignment mechanisms constitutes an equally or more fundamental barrier. Factor analysis further confirms that skills mismatch, employer curriculum engagement, and work placement effectiveness are the dominant dimensions influencing alignment outcomes, with curriculum misalignment emerging as the most critical structural barrier.

When synthesized, the findings clearly address the research questions by establishing that both TVET funding adequacy and industry alignment significantly influence economic development output, with industry alignment exerting the stronger effect. The combination of descriptive statistics, correlation, regression, and factor analysis provides consistent and converging evidence, enhancing the robustness of the conclusions. The study fills a critical gap in the literature by integrating resource and alignment dimensions of TVET institutional performance within a single empirical framework applicable across all six geopolitical zones of Nigeria. It introduces a more refined understanding by demonstrating that TVET's developmental contribution is constrained by institutional weaknesses operating simultaneously on the supply side (funding) and the demand interface

(alignment), and that reform must address both dimensions concurrently. In practical terms, the findings suggest that achieving meaningful economic development through TVET requires both significantly increased public investment and the institutionalization of deep, ongoing employer engagement in curriculum design, qualification development, and graduate assessment. The generalizability of findings is bounded by reliance on perceptual survey data and the absence of longitudinal tracking of graduate economic outcomes, which future research should address.

Conclusion

This study examined the effect of Technical and Vocational Education and Training on economic development in Nigeria, with specific focus on TVET funding adequacy and industry alignment as key institutional determinants of economic development output. Drawing on data from 531 TVET stakeholders across Nigeria's six geopolitical zones, the study established that both institutional dimensions exert significant positive effects on economic development outcomes, with industry alignment emerging as the dominant predictor. The adjusted R^2 of 0.622 confirms a strong and statistically valid model, while factor analysis reveals that skills mismatch, curriculum obsolescence, and chronic underfunding are the primary structural barriers to TVET's developmental effectiveness.

The findings confirm that sustainable economic development through TVET cannot be achieved through resource provision alone. The primacy of industry alignment as a development driver establishes that the most durable pathway to TVET-led economic growth lies in institutionalizing employer co-investment in curriculum design, expanding functional work placement infrastructure, and aligning qualification frameworks with the actual competency demands of productive industries. Simultaneously, significantly increased and sustained public funding for TVET infrastructure, equipment, instructor development, and curriculum revision

represents a necessary, if not sufficient, condition for transforming the sub-sector into an effective development instrument.

Recommendations

Based on the findings, the following recommendations are made. First, the Federal Government and state governments should substantially increase public investment in TVET, targeting a minimum of 20 percent of the education budget for technical and vocational education over a ten-year reform horizon, with ring-fenced allocations for equipment procurement, workshop rehabilitation, instructor salary improvement, and curriculum development. Transparent expenditure tracking mechanisms should be institutionalized to ensure that resources reach the institutional level where learning occurs rather than being absorbed in administrative overheads.

Second, the National Board for Technical Education should establish a statutory Industry-TVET Curriculum Advisory Framework that requires major industrial enterprises and sectoral employer associations to participate in the periodic review and validation of TVET programme curricula. Drawing on the structural models of Germany's dual system and South Korea's industry-integrated technical colleges, this framework should obligate employers in priority sectors including manufacturing, construction, agriculture, digital services, and renewable energy to co-design competency standards and validate qualification frameworks against current labour market requirements.

Third, a national public-private partnership mechanism for TVET co-financing should be legislated, establishing tax incentive frameworks for companies that provide workplace training placements, contribute to sectoral TVET training funds, or co-invest in equipment procurement for technical colleges. This mechanism should be designed to complement, not substitute for, increased public investment, diversifying TVET's financing base while ensuring that employer engagement produces genuine

curriculum co-ownership rather than nominal participation.

Fourth, a structured national instructor development programme should be instituted, combining academic upgrading pathways with mandatory industry attachment periods for all technical college instructors. Regular industry placements of no fewer than eight weeks annually should be required, and mechanisms for attracting experienced practitioners from industry into teaching roles on flexible contractual terms should be established, specifically targeting sectors where the gap between current TVET content and industrial practice is most acute.

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