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STRENGTHENING NIGERIA'S WORKFORCE THROUGH TVET: A FRAMEWORK FOR ATTRACTIVENESS AND IMPLEMENTATION

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Abstract

The objective of this study was to examine relationship between Nigerian Technical and Vocational Education and Training (TVET) institutions engagements with industry partners. The ordinal regression model was used to examine the relationship between the frequency of industry engagement and three predictor variables namely, incorporating industry-relevant examples/case studies, involving partners in curriculum development review, and considering industry feedback important in shaping curriculum. The threshold coefficients suggest that TVET institutions may face challenges in increasing their engagement with industry partners, particularly when transitioning from rare to daily engagement. TVET institutions that engage daily or weekly with industry partners may have a moderate chance of increasing or reducing their engagement. TVET institutions that engage quarterly with industry partners may have a relatively high chance of reducing their engagement to an annual basis. TVET institutions can enhance their engagement with industry partners by incorporating more industry-relevant examples and case studies into their curriculum and involve industry partners in curriculum development review. It is essential to note that these findings are based on a statistical analysis and may not be generalizable to all TVET institutions or industry partners. Further research is needed to explore the nuances of TVET-industry partnerships and to identify best practices for enhancing engagement.

Keywords: Curriculum, Collaborations, Industry, Skills, TVET

Introduction

Technical and Vocational Education and Training (TVET) programs in Nigeria play a crucial role in developing the skills of the workforce, which is essential for increasing competitiveness in the global market. A skilled workforce enables Nigerian businesses to produce high-quality goods and services, making them more competitive in the international market. TVET programs in Nigeria are designed to address labor market needs, which are often influenced by trade agreements. For example, Nigeria's membership in the African Continental Free Trade Area (AfCFTA) requires the country to develop a skilled workforce that can compete with other African countries. TVET programs help to address this

need by providing training in areas such as manufacturing, agriculture, and services. Also, TVET programs in Nigeria support industrialization and diversification efforts by providing training in construction. This helps to reduce the country's dependence on oil exports and promotes economic diversification.

TVET programs in Nigeria also focus on trade facilitation and logistics, which are critical components of trade policy. By providing training in areas such as supply chain management, transportation, and warehousing, TVET programs help to improve the efficiency of trade facilitation and logistics in Nigeria. TVET programs in Nigeria contribute to human capital development, which is essential for economic growth. By providing training and education in areas such as entrepreneurship, innovation, and technology. TVET programs help to promote economic growth and development in Nigeria.
As part of efforts to improve TVET-industry engagement in Nigeria, researchers have explored various strategies. There is a growing recognition of the importance of industry involvement in TVET programs, which can lead to increased partnerships and collaborations (Korter, 2023a; Korter, 2023b; Onwusa, 2021).
Akanbi (2017) analyses the TVET policy framework in Nigeria and identifies challenges and opportunities for improving TVET programs. The article highlights the importance of industrial engagement in TVET programs. TVET programs should provide practical skills training that is relevant to industry needs. TVET institutions should establish partnerships with industries to inform curriculum development, provide internship opportunities, and enhance employability. The government, industries, and other stakeholders should collaborate to support TVET programs and ensure their relevance to industry needs. The article identifies several challenges to industrial engagement in Nigeria's TVET programs. The article notes that TVET institutions in Nigeria have limited partnerships with industries, hindering the development of relevant curricula and the provision of practical training opportunities. There is inadequate funding of TVET programs in Nigeria, which limits their ability to establish and maintain industry partnerships. Lastly, the article notes that TVET programs in Nigeria lack standardization, making it difficult to ensure that they meet industry standards and requirements.

Diji, Adeniji, and Bassey (2015) examines the role of TVET in addressing youth unemployment in Nigeria. The authors analyze the challenges facing TVET programs in Nigeria and their impact on youth employability. Diji et al (2015) highlights the importance of industrial engagement in TVET programs, noting the lack of industrial relevance, limited internship opportunities and the need for industry partnerships in TVET institutions. The authors emphasize the need for TVET institutions to establish partnerships with industries to inform curriculum development, provide internship opportunities, and enhance employability.
Bello and Muhammad (2021) provide an in-depth analysis of the TVET sector in Nigeria, examining its structure, challenges, and repositioning strategies. The authors highlight the importance of TVET in driving economic growth and development but note that the sector faces numerous challenges that hinder its effectiveness. The article provides several repositioning strategies for TVET industrial engagement in Nigeria. TVET institutions should establish partnerships with industries to inform curriculum development, provide internship opportunities, and enhance employability. TVET institutions should develop standardized curricula that meet industry standards and requirements. The government and private sector should increase funding for TVET programs to support the establishment and maintenance of industry partnerships.

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Yustus, Saidu, and Giroh (2021) examines the prospects and challenges of Vocational and Technical Education (VTE) in Nigeria, with a focus on industrial engagement. Yustus et al (2021) note that VTE programs can provide entrepreneurship training, which can support the development of small and medium-sized enterprises (SMEs) and create job opportunities if VTE-industry partnership is strengthened.

UNESCO (2002) examines the state of TVET in sub-Saharan Africa, highlighting its potential to drive economic growth and development. The report emphasizes the need for TVET programs to be relevant to industry needs and requirements. The report provides several recommendations for improving TVET industrial engagement in sub-Saharan Africa. These include establishing industry partnerships, developing practical skills training programs and increasing industry involvement. Similarly, UNEVOC (1996) report focuses on establishing partnerships in Technical and Vocational Education (TVE) between educational institutions, industries, and governments. The report highlights the importance of partnerships in ensuring that TVE programs are relevant to industry needs and requirements.

UNESCO (2019) examines the relationship between education, migration, and displacement. While not exclusively focused on TVET, the report highlights the importance of vocational education and training in providing skills for employability and entrepreneurship. While Hoeckel (2010) suggests that VET programs should be flexible and responsive to labor market needs. Noting that industry partnerships are critical to ensuring that VET programs are relevant and effective. The report emphasizes the importance of TVET industrial engagement, including strong industry partnerships, work-based learning, and industry involvement in curriculum development, to ensure that VET programs are relevant and effective in preparing students for the labour market. The objective of this study is to examine relationship between TVET institutions engagements with industry partners for an improved skilled work force.

Data Collection Methods

A structured questionnaire via google form was administered to TVET academics in Nigeria to gather information on their industrial engagement, perceived benefits, challenges, and strategies for effective engagement. 69 responses were received across Nigerian TVET institutions.

Data Analysis Methods

Qualitative data was used in this survey. Descriptive statistics will be used to summarize the demographic characteristics of the participants and their responses to the survey questionnaire. Inferential statistics will be used to examine the relationships between variables and to identify predictors of industrial engagement.

Ordered Logistic Regression (OLR) Model

The OLR model is a type of regression analysis that is used to model the relationship between a predictor variable (or variables) and an ordinal response variable. The model estimates the probability of each category of the response variable, given the values of the predictor variables.

Mathematical Formulation

Let's denote:

Y: The ordinal response variable with K categories (Y = 1, 2, ..., K)
X: The predictor variables (X = x1, x2, ..., xp)
πk: The probability of category k (k = 1, 2, ..., K)

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β: The vector of regression coefficients
αk: The threshold parameters (k = 1, 2, ..., K-1)

The OLR model can be formulated as:

$$P(Y \leq k \mid X) = \Phi(\alpha k - \beta'X)$$

where:
Φ: The cumulative distribution function (CDF) of the logistic distribution
αk: The threshold parameters that define the boundaries between categories

The probability of each category can be calculated as:

$$P(Y = k \mid X) = P(Y \leq k \mid X) - P(Y \leq k-1 \mid X)$$

Model Estimation
The OLR model is typically estimated using maximum likelihood estimation (MLE). The log-likelihood function is:

$$\ell(\beta, \alpha) = \Sigma[Yk * \log(P(Y = k \mid X)) + (1-Yk) * \log(1-P(Y = k \mid X))]$$

where:

Yk: The indicator variable for category k (Yk = 1 if Y = k, 0 otherwise)

The MLE estimates of the regression coefficients and threshold parameters are obtained by maximizing the log-likelihood function.

Model Interpretation
The OLR model estimates the probability of each category of the response variable, given the values of the predictor variables. The regression coefficients represent the change in the log-odds of each category, given a one-unit change in the predictor variable.
For example, if we have an ordinal response variable with three categories (Y = 1, 2, 3), the OLR model estimates the probability of each category as:

$$P(Y = 1 \mid X) = \Phi(\alpha 1 - \beta'X)$$
$$P(Y = 2 \mid X) = \Phi(\alpha 2 - \beta'X) - \Phi(\alpha 1 - \beta'X)$$
$$P(Y = 3 \mid X) = 1 - \Phi(\alpha 2 - \beta'X)$$

The regression coefficients (β) represent the change in the log-odds of each category, given a one-unit change in the predictor variable.

Results and Discussion
This session is aimed at investigating TVET engagement with industry partners.
B3 <- How often do you engage with industry partners?
C1 <- How often do you incorporate industry relevant examples/case studies into your teaching?
C2 <- Do you involve partners in curriculum development review?

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C3 <- How important is industry feedback in shaping your curriculum?

Table 1.0 Ordered Logistics Regression (OLR)

Table 1.1

link threshold	nobs	logLik	AIC	niter	max.grad	cond.H
logit flexible	69	-93.40	202.79	7(3)	1.50e-11	3.7e+03

Table 1.2 Coefficients:

C1	C2	C3
0.16383	0.37698	-0.09069

Table 1.3 Threshold coefficients:

Rarely|Daily	Daily|Weekly	Weekly|Monthly	Monthly|Quarterly	Quarterly|Annualy
0.03023	0.21496	0.27583	0.51344	1.05341

Table 1.4 Re-fitting to get Hessian

Table 1.4.1 Coefficients:

	Value	Standard Error	t value
C1	0.16383	0.1873	0.8747
C2	0.37693	0.4760	0.7919
C3	-0.09067	0.2386	-0.3801

Table 1.4.2 Intercepts:

	Value	Std. Error	t value
Rarely|Daily	0.0302	1.0047	0.0301
Daily|Weekly	0.2150	1.0067	0.2136
Weekly|Monthly	0.2758	1.0075	0.2738
Monthly|Quarterly	0.5135	1.0105	0.5081
Quarterly|Annualy	1.0534	1.0135	1.0394

Residual Deviance: 186.7907

AIC: 202.7907

Model Summary

The ordinal regression model examines the relationship between the frequency of industry engagement (B3) and three predictor variables: incorporating industry-relevant examples/case studies (C1), involving partners in curriculum development review (C2), and considering industry feedback important in shaping curriculum (C3).

The model coefficients indicate the change in the log odds of moving up one category in the frequency of industry engagement (B3) for a one-unit change in the predictor variables, while holding all other predictor variables constant. C1 (Incorporating industry-relevant examples/case studies): The coefficient of 0.16383 indicates that for every unit increase in C1, the log odds of moving up one category in the frequency of industry engagement (B3) increase by approximately 0.16. However, this effect is not statistically significant ($p > 0.05$). C2 (Involving partners in curriculum development review): The coefficient of 0.37693 indicates that for every unit increase in C2, the log odds of moving up one category in the frequency of industry engagement (B3) increase by approximately 0.38. However, this effect is not statistically significant ($p > 0.05$). C3 (Considering industry feedback important in shaping curriculum): The coefficient of -0.09067 indicates that for every unit increase in

C3, the log odds of moving up one category in the frequency of industry engagement (B3) decrease by approximately 0.09. However, this effect is not statistically significant ($p > 0.05$).

The threshold coefficients in the TVET ordinal regression model provide additional insights into the relationship between the predictor variables and the ordinal outcome variable, which represents the frequency of industry engagement. The threshold coefficients represent the log odds of moving up one category in the frequency of industry engagement. In other words, they indicate the point at which the probability of moving up to the next category is 50%. Based on the threshold coefficients, we can interpret the results as follows:

Rarely|Daily: The threshold coefficient of 0.03023 indicates that the log odds of moving from "Rarely" to "Daily" are relatively low, suggesting that it may be challenging for TVET institutions to transit from rare to daily engagement with industry partners.

Daily|Weekly: The threshold coefficient of 0.21496 indicates that the log odds of moving from "Daily" to "Weekly" are moderate, suggesting that TVET institutions that engage daily with industry partners have a moderate chance of increasing their engagement to a weekly basis.

Monthly|Quarterly: The threshold coefficient of 0.51344 indicates that the log odds of moving from "Monthly" to "Quarterly" are moderate, suggesting that TVET institutions that engage monthly with industry partners have a moderate chance of reducing their engagement to a quarterly basis.

Quarterly|Annualy: The threshold coefficient of 1.05341 indicates that the log odds of moving from "Quarterly" to "Annualy" are relatively high, suggesting that TVET institutions that engage quarterly with industry partners have a relatively high chance of reducing their engagement to an annual basis.

The threshold coefficients suggest that TVET institutions may face challenges in increasing their engagement with industry partners, particularly when transitioning from rare to daily engagement. TVET institutions that engage daily or weekly with industry partners may have a moderate chance of increasing or reducing their engagement. TVET institutions that engage quarterly with industry partners may have a relatively high chance of reducing their engagement to an annual basis.

The model fit statistics indicate that the model has a residual deviance of 186.7907 and an AIC of 202.7907. These statistics suggest that the model provides a moderate fit to the data.

Table 2.0: Odd Ratios

TVET and Industry Partners Engagement

C1	C2	C3
1.1780136	1.4578003	0.9133152

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The result presents the exponential coefficients (e^β) for the three predictor variables:

C1 (Incorporating industry-relevant examples/case studies): The exponential coefficient of 1.1780136 indicates that for every unit increase in C1, the odds of TVET institutions engaging with industry partners increase by approximately 17.8% (1.178 - 1).
C2 (Involving partners in curriculum development review): The exponential coefficient of 1.4578003 indicates that for every unit increase in C2, the odds of TVET institutions engaging with industry partners increase by approximately 45.8% (1.458 - 1).
C3 (Considering industry feedback important in shaping curriculum): The exponential coefficient of 0.9133152 indicates that for every unit increase in C3, the odds of TVET institutions engaging with industry partners decrease by approximately 8.7% (1 - 0.913).

Conclusion

The results of this ordinal regression model suggest that incorporating industry-relevant examples/case studies (C1), involving partners in curriculum development review (C2), and considering industry feedback important in shaping curriculum (C3) may not have a statistically significant impact on the frequency of industry engagement (B3). The frequency of industry engagement (B3) may be influenced by other factors not included in this model.
Overall, this model provides a starting point for understanding the relationship between TVET institutions and industry partners. However, further research is needed to explore other factors that may influence this relationship.
Incorporating industry-relevant examples/case studies (C1) has a positive, albeit modest, effect on TVET institutions' engagement with industry partners. Also, involving partners in curriculum development review (C2) has a stronger positive effect on TVET institutions' engagement with industry partners. Considering industry feedback important in shaping curriculum (C3) has a negative, albeit modest, effect on TVET institutions' engagement with industry partners.

Recommendation

Based on these findings, TVET institutions can take the following steps to enhance their engagement with industry partners. Incorporate more industry-relevant examples and case studies into their curriculum to make it more relevant and attractive to industry partners. Involve industry partners in curriculum development review to ensure that the curriculum is aligned with industry needs and priorities. Re-evaluate the importance of considering industry feedback in shaping curriculum, as it may not be as critical a factor as previously thought.
It is essential to note that these findings are based on a statistical analysis and may not be generalizable to all TVET institutions or industry partners. Further research is needed to explore the nuances of TVET-industry partnerships and to identify best practices for enhancing engagement.

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