IAA Journal of Scientific Research 6(1):41-47, 2020.

Identified Best Optimizing Performance Pointers in the Tertiary Level of Education

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ABSTRACT

To move against the problems facing the tertiary level of education, the quality of education needs to be measured. Different methods and strategies have been designed and developed for identifying and measuring what can be termed the quality of education. Though there are emerging researches on what can be termed key performance indicators or pointers for various strategic sections and areas for easier evaluation. The focus of this work is to show that not all key performance pointers are actually required in any particular section and the method to identify them. Multiple regression analysis was used to examine the dependence of a dependent variable on other independent variables or predictors over the stated hypothesis. The F-test was used to validate the regression equation hence the hypothesis and the Student-t test was used to determine the significant predictors in the regression equations. Based on the data available, it is observed that data measures, IT usage, IT help and Computer lab measures are significant predictors for the dependent variable in the analyzed period 2010-2019.
Keywords:Education, quality, emerging, performances and pointers

INTRODUCTION

The problems thrown up by the educational system are not usually problems arising from concept nevertheless problems arising out of practice [1]. The philosophy of education engages in a higher-order activity with interest in conceptual clarity as a preliminary to the explanation of educational theory and practice.Philosophy of education consists largely of a critical comment on educational theory and educational theory itself consists of a number oftheories of varying scopes and complexities [2]. A general theory contrasts from a limited theory in that it aims to give a wide spread programme for producing a certain type of person – an educated man, whereas a limited theory aims at particular educational issues, such as how this subject should be taught, orhow children of this age and this ability should be dealt with – the practice [3].

The aim of education is not only for the benefit of the individual but also for the society in general, this cannot be over emphasized.Formal, non-formal or informal education builds itself as a necessity and represents an important pillar of the knowledge society.[4], stated that"the collective impact of these educational benefits helps individuals to have more options for and to make better decisions about their lives. Enhanced options and decision-making comprises better choices about work, improved risk assessment regarding deviant or criminal behavior, and better personal health choices. Thus, the cognitive-intellectual gains that children and youth make in school supports to the social and economic benefits derived from education for all members of society" [5].

Education still with its huge visible benefits is still barraged with various numerous problems that is still increasing in some developing and under-developed countries like Nigeria. regrettably,education in Nigeria is engulfedwith myriads of problems, which comprises; meagre funding and thus poor educational facilities, insufficient classrooms, teaching aids, paucity of

quality teachers and quality academic content [6]. Realization of quality tertial education in Nigeria requires continuous and all-inclusive improvement which demands cost sharing among stakeholders both internal and external. Stakeholders' collaboration is about exploring partnership with another organization or group owing to lack of resources or capabilities [7,8,9,10] all believed that there is a relation between quality in higher education with student intake, academic programs, program designs, lecturers, teaching and learning, students' experiences and academics as well as non-academic support for the students – hence the need for quality assurance.

Quality as defined by the International Organization of Standardization (1994) is the totality of features and characteristics of a product of service that bear on its ability to satisfy stated needs. According to Article II of the World Declaration on Education (2003), quality is a multidimensional concept which should encompass all the functions and activities in schools. [11] describesquality assurance in any educational institution as that which specifies the pre-eminence and special features that makes the institution distinct from other forms of institution.quality assurance can be seen as a holistic term that is directed towards education as an entity, it also entails the suppliers and consumers and all the various activities put in place to produce quality products and services [12]. Quality assurances in education aim atpreventing quality problems and ensure that the products ofthe system conform to the expected standards. [13] summated that; the concept of quality assurance in the education system can be looked from two angles, the internalperspective (within the system) and external perspective(check and balance by the regulator body or agencies). Suffixto say, quality assurance serves as a yard stick and life wire formeasuring quality and standards. It is a process of evaluatingand re-evaluating the worth of any valuable object, it worth ofnoticing that quality assurance can only be effective and efficient with proper management.

[14], states that quality can be measured as a dimension which can be seen as an indicator, he went further to state that "all indicators are variables, but not all variables are indicators".Indicators could be in the form of percentages,numbers, testscores, levels of participation or perceptions of student achievementwhich can also represent a single or multiple input, process or outcome for comparison or evaluation [15]. The simple measures of the components of a performance under consideration changes an indicator to a Performance Indicator. When supported with sound data collection, perhaps involving formal surveys, analysis and reporting, performance indicators enable managers to track progress, demonstrate results, and take corrective action to improve service delivery. For [16] performance indicators are data indices of information by which the functional quality of institutions or systems may be measured and evaluated.When the performance indicators enjoy some extra importance depending on the aspect of the performance being measured it can then be regarded as Key performance indicator or pointers (KPP).

Even though there is emerging research on KPI used in higher education, there have been no identifiedbest practices to measure institutional quality, and current measures often are not adequate to measure holistically an entire institution and its operations [17].

A study by the Rockefeller Institute of Government for reviewing 29 performance reports of public colleges and universities in the United States that were submitted to the state legislatures revealed a lack of common indicators in allowing the tracking of performance. After combining measures with similar intent but different names, they found 158 distinct performance measures. After further analysis,only eight KPP of the 158 KPP were used by morethan half the institutions. These eight common indicators were graduationMeasures, enrollment, sponsored research/Grants,

student transfers, tuition, financial aid, degrees awarded, licensure test scores [18].Other areas KPP can be measured in the education sector includes:Admissions, Advancement, Alumni, Athletics, Business Connections, Community Connections, Course Measures, Education Connection, Employee/Human Resources, Facilities, Financials, Library, Retention, Satisfaction, Strategic Planning, Student Engagement, Student success, Technology.

[19], describe possible KPP relatedtoeach strategic area for educational institutions. For the area of strategic planning and growth of an institution, the KPI should focus on: "student enrollment, ranking by independent agencies, number of patents, graduation rate, research dollars attracted, publications by faculty, and satisfaction of the stakeholders. For Information Technology, the KPP should focus on: Computer lab measures, Computer management systems, Data measures, IT Effectiveness measures, IT help, IT usage

Determining which indicators are key pointers within an areain the higher education institutionsis the focus of this study.

METHODOLOGY

The multiple regression model can be much more realistic than the uni-factorial regression model Goschin and Vatui, 2002, it also studies the simultaneous emotions that some independent variables have over one dependent variable Lefter, 2004. This analysis generally belongs to the multivariate methods, and it is also an explanatory method of analysis.The data for the analysis was from the Information and Technology (IT) unit of Federal Polytechnic Oko. Five indicators were selected, this includes: Computer lab measures, Computer management systems (Cost), Data measures, IT Effectiveness measures, IT help, IT usage. These performance indicators were analyzed with multiple regression analysis.From the obtained data, the regression equation was developed and the calculation for the coefficient of determination R^2 was done – it indicates the percent of how much of thetotal variance is explained by the independent variables. in order to determine which hypothesis can be accepted, the F test and Student test was used with n-(k+1) degrees of freedom

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RESULTS AND DISCUSSIONS

This study was to determinethe actual KPP's in the IT area - that is identifying the **Impact of IT**(dependent variable) as being influenced by the five independent variables and what are those measures that should be taken based on the results obtained with using SPSS - Statistical Package for Social Sciences [C. Constantin, 2006] on the table below.

Table 1 Key Perormance Pointers report of FPO from Jan. 2019 to Oct. 2019

Year	Impact of IT	Data measures	IT usage	IT help	Computer management systems (cost)	Computer lab measures
2010	912	438	705.24	11.2	3008.25	179
2011	71616	96753	9010.45	501.8	5102.2	290
2012	9425	19456	5602.54	44.65	4008.24	300
2013	15090	26567	6376.52	54.63	4925.47	350
2014	42266	49616	7068.23	59.25	5674.55	390
2015	44886	51185	6503	61.32	8935.5	400
2016	98060	100968	5305.89	79.2	9954.2	510
2017	46948	46052	4155.12	56.23	13132.25	590
2018	90647	99654	3501.25	81.62	20001.2	610
2019	90125	100455	3908.12	65.58	13814.56	780

Then the analysis goes thus:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	1560.357	7981.324		0.196	0.855	-20599.351	23720.065
	Data measures	1.006	0.116	1.071	8.674	0.001	0.684	1.328
	IT usage	-0.985	1.154	-0.063	-0.854	0.441	-4.189	2.218
	IT help	-34.709	24.247	-0.138	-1.431	0.226	-102.030	32.611
	Computer management systems	0.081	0.761	0.012	0.107	0.920	-2.032	2.194
	Computer lab measures	-4.746	24.606	-0.024	-0.193	0.856	-73.064	63.573

a. Dependent Variable: Impact of IT

Using the Unstandardied Coefficients, the regression equation is:

$$\hat{y} = 1560.357 + 1.006x_1 - 0.985x_2 - 34.709x_3 + 0.081x_4 - 4.746x_5$$

Where x_1 =Data measures, x_2 =IT usage, x_3 =IT help, x_4 =Computer management systems(Cost) and x_1 = Computer Lab measures.

Table 3 Estimation of Deviation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.994[a]	0.989	0.975	5598.21922	0.989	71.945	5	4	0.001	1.284

a. Predictors: (Constant), Computer lab measures, IT usage, IT help, Computer management systems, Data measures

b. Dependent Variable: Impact of IT

From Table 3, $R^2 = 98.9\%$ indicates the measure of how close the data are to the fitted regression line, it is also known as the coefficient of determination or of multiple determination. Table 4 gives the analysis of variance for the regression; hence, greater part of total variance is generated by the regression equation.

Table 4 ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11273851918.606	5	2254770383.721	71.945	.001[b]
	Residual	125360233.894	4	31340058.474		
	Total	11399212152.500	9			

a. Dependent Variable: Impact of IT

b. Predictors: (Constant), Computer lab measures, IT usage, IT help, Computer management systems,

The test on the stated hypothesis will validate the regression equation, the regression coefficients of the sample have as correspondents the following regression coefficients$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$. Then the alternative and null hypothesis are:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

$$H_1 = some\ \beta\ coefficients \neq 0$$

To investigate the null hypothesis, the F-test that requires an analysis of the variance established earlier in Table 4. The value of the calculated F is 71.945

while critical value of F, at the significance level of 0.05 with 5 degrees of freedom at numerator and 4 at denominator (ie $F_{0.05,5,4}$) is 6.26. Since $F_{Cal} > F_{Cri}$; we accept the alternative hypothesis H_1, thus some $\beta\, coefficients \neq 0$, establishing that a significant influence of multiple regression model occurs over the dependent variables. To investigate and determine the $\beta\, coefficients = /\neq 0$, the analysis will resort to Student-t test with $n-(k+1)$ degrees of freedom, Kulcsar, 2009. In order to define the decision ruleconcerning the null hypothesis, the calculated t values (see Table 2) will be compared with the critical value of t at asignificance level of 0.05 in the case of a two-tailed test, with $10-(5+1)$, meaning with 4 degrees of freedom.This value is ± 2.78. Thus:

Table 5. T test for B coefficients

Variable	T-Cal	T-critical	Decision
Data measures	8.674	2.78	T-Cal > T-critical; H_0 is rejected; $\therefore\ \beta_1 \neq 0$
IT usage	−0.854	−2.78	T-Cal > T-critical; H_0 is rejected; $\therefore\ \beta_2 \neq 0$
IT help	−1.431	−2.78	T-Cal > T-critical; H_0 is rejected; $\therefore\ \beta_3 \neq 0$
Computer management systems(Cost)	0.107	2.78	T-Cal < T-critical; H_0 is accepted; $\therefore\ \beta_4 = 0$
Computer lab measures	−0.193	−2.78	T-Cal > T-critical; H_0 is rejected; $\therefore\ \beta_5 \neq 0$

From Table 5 it can be seen that Computer management systems is not significant predictor for the dependent variable, hence in the next regression model will exclude it.

Table 6 Estimation of Deviation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.994[a]	0.989	0.980	5014.30847	0.989	112.092	4	5	0.000	1.235

a. Predictors: (Constant), Computer lab measures, IT usage, IT help, Data measures

b. Dependent Variable: Impact of IT

From Table 6, $R^2 = 98.9\%$

Table 7 **Coefficients[a]**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1687.831	7068.172		0.239	0.821	-16481.483	19857.146
	Data measures	1.010	0.098	1.075	10.306	0.000	0.758	1.262
	IT usage	-1.035	0.945	-0.067	-1.096	0.323	-3.464	1.394
	IT help	-34.807	21.702	-0.139	-1.604	0.170	-90.595	20.981
	Computer lab measures	-3.340	18.608	-0.017	-0.179	0.865	-51.173	44.493

a. Dependent Variable: Impact of IT

The new regression equation:$\hat{y} = 1687.831 + 1.010x_1 - 1.035x_2 - 34.807x_3 - 3.340x_5$

Table 8 ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11273495705.267	4	2818373926.317	112.092	.000[b]
	Residual	125716447.233	5	25143289.447		
	Total	11399212152.500	9			

a. Dependent Variable: Impact of IT

b. Predictors: (Constant), Computer lab measures, IT usage, IT help, Data measures

The value of the calculated F is 112.092 while critical value of F, at the significance level of 0.05 with 4 degrees of freedom at numerator and 5 at denominator (ie $F_{0.05,4,5}$) is 5.19. Since$F_{Cal} > F_{Cri}$; we accept the alternative hypothesis H_1.To investigate and determine the $\beta\ coefficients =/\neq 0$, the analysis will resort to Student-t test with $n-(k+1)$ degrees of freedom. The calculated t values (see Table 7) will be compared with the critical value of t at asignificance level of 0.05 in the case of a two-tailed test, with $10-(4+1)$, meaning with 5 degrees of freedom.This value is ± 2.57. Thus:

Table 9. T test for B coefficients

Variable	T-Cal	T-critical	Decision
Data measures	10.306	2.57	T-Cal > T-critical; $H_0$is rejected; $\therefore\ \beta_1 \neq 0$
IT usage	-1.096	−2.57	T-Cal > T-critical; $H_0$is rejected; $\therefore\ \beta_2 \neq 0$
IT help	-1.604	−2.57	T-Cal > T-critical; $H_0$is rejected; $\therefore\ \beta_5 \neq 0$
Computer lab measures	-0.179	−2.57	T-Cal > T-critical; $H_0$is rejected; $\therefore\ \beta_5 \neq 0$

Based on the data available, it is observed that Data measures, IT usage, IT help and Computer lab measures are significant predictors for the dependent variable in the analyzed period 2010-2019.

CONCLUSION AND RECOMMENDATIONS

As can be seen from the results, not all the indicators are needed for measuring performance in the area of Information Technology, in this case considering'Impact of IT' serving as the dependent variable. Selection of appropriate indicators that will be used for measurement and appraisal of the performance is a very important activity. KPI are static and stable indicators that carry more meaning when comparing information. They help to remove the emotion away from object of the business and get one focus on the thing what job is really about, and that is making progress.Many organizations, industries, institutions etc. are always engaged in identifying and improving on their KPI's without actually trying to identifying the real KPI's as seen in the results from the previous section. identifying the actual performance indicators will also make it easier for establishing a good powerful correlation between the various independent variables. It can also serve as a developing and guiding functions – because they present a base for formulating and implementation of the strategy of the organization .

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