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IMPACT OF TOTAL QUALITY MANAGEMENT ON PERFORMANCE OF OIL SERVICING COMPANIES IN PORT HARCOURT

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ABSTRACT

The impact of Total Quality Management (TQM) on the performance of selected oil and gas servicing companies in Port Harcourt was investigated in this work. The population of the study was top management staff with roles related to quality improvement in the companies considered. Purposive sampling techniques were applied in the choice of sampled companies while random sampling was applied in respondent sampling within the companies. Questionnaire was the major instrument employed for data collection. Kendall's Coefficient of Concordance and Principal Component Regression (PCR) with XLSTAT statistical computer application were the methodologies employed for data analyses. The analyses of Kendall's coefficient of concordance revealed that the pipeline and fabrication oil and gas servicing companies have a higher degree of agreement amongst the sampled workers on total quality management (57.75%) as against engineering procurement and construction (EPC) oil and gas servicing companies (35.5%). The developed models from PCR application were used to evaluate the effect of the identified key business performance indicators from two perspectives; Importance of total quality management on the indicators and the place of effective practice of total quality management on the identified indicators. The R^2 value of the regression between TQM and the performance indicators was estimated at 0.51. The study revealed that lack of top management commitment and lack of resources are the major barriers to effective implementation of TQM initiatives. The study also revealed that commitment to quality policies by top management, increased awareness through training and employees involvement are among the factors responsible for effective implementation of TQM.

KEYWORDS: Kendall's Coefficient of Concordance, Principal Component Regression, Questionnaire, Purposive Sampling, Total Quality Management,

INTRODUCTION

Total quality management (TQM) is an integrated organizational effort designed to improve quality at every level. It is an operational strategy that emanated from Japan and Great Britain's Tavistock institute [1]. In the business environment where competition is always on the increase, customers choose their service providers using quality delivery as a yardstick. Many organizations now have better understanding of the consequences of poor quality because it determines the performance of organizations. Poor service delivery could be lateness of providers to respond to complaints or poor performance of supplied equipment. Poor service delivery could lead to loss of customers and opportunities. For a typical service company, accuracy, completeness, timeliness, friendliness and courtesy are basic variables used to determine how the company performs. Adopting any management strategy is a function of the existing organizational culture which is also a function of the

organization's value system. The International Organization for Standardization (ISO) has set quality system standards for organizations in order to improve the efficiency and productivity of their operations. Hence, for any organization to remain competitive in this era, its processes and procedures must conform to standards set by ISO.

Quality has been defined as concordance to specifications, positing that quality is immeasurable [2]. Management refers to the planning, coordinating and controlling of the variables required to achieve a set target. The aim of implementing TQM strategy is to treat customers and clients as the focal point of achieving organizational success. Christos and Evangelos [3] evaluated the impact of TQM practices on the performance of organizations where the relationship between different soft TQM practices like leadership, strategic quality planning, employee management and involvement and their effect on quality management results in the form of market benefits like increase in profits, improved competitive position, improved performance and increased sales were explained. While customer satisfaction is measured by decline in customer complaints, increase in loyalty, and customer retention rate.

The effects of implementing TQM on employee performance of PT Pertamina refinery in Indonesia were investigated discovered there was a positive correlation [4]. TQM Variables include leadership management, supplier management, continuous evaluation, process improvement and control, education and training, customer focus, and strategic quality planning. The availability of quality-related information can have positive effects on product quality [5]. Using modern information methods for getting involved in collecting, storing, processing, and considering various pieces of information can greatly affect product quality [6]. An important reason for measuring the capability of a process is to be able to assess the ability of the process to sustain product tolerance [7]. Machinery and equipment are critical to the quality of products. Quality tools have been used as effective means of analysis and control, and they have contributed significantly to process improvement.

Education and training are identified as tools for continuous improvement [8]. **T**he causes of failure of TQM implementation have been identified [9]. Variables to measure company performance include employee satisfaction, product quality, customer satisfaction and strategic business performance [10-13]. Different performance measures can be applied to assess the overall performance of manufacturing firms and TQM is one of such measures [14]. The impact of total quality management on the performance of organizations has been studied by several researchers [15-18]. The application of TQM has now been extended to servicing companies, and some are of the view that there is a sudden shift in the application of TQM from manufacturing to service organizations [19]. This present also focus on the application to TQM to service organizations. Total quality management has also been applied to education and key challenges in its implementation have been investigated. [20-22].

There are two perspectives to customer satisfaction which are transaction-specific and cumulative. There is poor service delivery in many organizations rendering services to different categories of customers. Focusing on oil and gas serving companies which are many in number and are also in competition, poor service delivery has to be avoided because it goes with a lot of adverse consequences. This work thus tends to address the problem of poor service delivery in oil and gas servicing companies Port Harcourt.

MATERIALS AND METHODS

The research questions this study is aimed as answering includes:

i) What are the major barriers to total quality management in the oil and gas servicing industries?
ii) What is the awareness level of workers in oil and gas servicing companies on total quality management?
iii) What key business performance indicator has positive influence on total quality management with respect to its importance and practice.

Some hypotheses are tested in this research which includes:

H 1: There is significant, positive relationship between TQM and organizational performance
H 1-1: There is significant, positive relationship between Top management (leadership) commitment and organizational performance
H1-2: There is significant, positive relationship between Supplier Quality Management and organizational performance.
H1-3: There is significant, positive relationship between Customer focus and organizational performance.
H1-4: There is significant, positive relationship between Process management and organizational performance
H1-5: There is significant, positive relationship between employee education and training and organizational performance.
H1-6: There is significant, positive relationship between Employee relation and organization performance.
H1-7: There is significant, positive relationship between strategic planning and organization performance.

To test the above hypotheses, data has to be collected and analyzed using different tools.

Research Design, study area and study population

The design chosen for the study is the opinion survey design. The research process involved gathering, tabulating, describing, analyzing and interpretation of data on impact of total quality management on performance of oil servicing companies in Port Harcourt. The study area of this research is Port Harcourt city in Rivers State, Nigeria. The population of this study was limited to oil and gas servicing companies with respect to Engineering, Procurement and Construction (EPC) services and pipeline and fabrication (PAF) services.

Sampling and Sampling Technique

The sampling techniques employed in this study were purposive and random sampling techniques. Random sampling technique is a probability technique in which every item or unit in the population has equal chance of being selected in the sample and this probability can accurately be determined. However, in some cases not everyone has same probability of selection [23]. This was applied for sampling of respondents within the sampled companies while purposive sampling was applied in the choice of sampled oil and gas servicing companies. The following population formula was applied [24],

$$N = \frac{Z^2 P(1-P)}{T^2} \quad (1)$$

Where N represents the sample size, T is tolerance error (0.05); P is probability of 95% and Z = 1.96, which is the level of significance and corresponds to 95% confidence level.

Method of Data Collection / Instrumentation and Analysis

Primary and secondary data were collected with respect to this study. The major instrument used for data collection was questionnaires. General information such as size of the organization, quality initiatives, awards won, and position of the respondents were enquired in section 1.Section 2 was designed to obtain opinions of respondents about concept of TQM. This was done by making categorical statements and giving them the choice of agreeing or disagreeing to the stated opinions. Section 3 was designed to examine the level of TQM implementation in the selected oil servicing companies in Port Harcourt. To achieve this, questions were tailored to assess the respondents' perception on the level of importance of each TQM as well as the actual level of practice in their organizations. In section 5, perception on barriers to the successful implementation of TQM was assessed. The level of agreement for all the questions were rated on a 5point Likert scale ranging from strongly disagree to strongly agree. 1 represented strongly disagree, 2 represented disagree, 3 represented neutral, 4 represented agree and 5 represented strongly agree. The statistical package employed for data analysis was XLSTAT 2016 (student edition). The methodologies applied for analyses of the collected data include Kendall's Coefficient of Concordance (w-statistic); and Principal Component Analysis (PCA).

Kendall's Coefficient of Concordance (w-statistic)

Kendall's coefficient of concordance estimates the extent of agreement between n objects ranked on k different variables in order to test the null hypothesis:

H_0: There is no agreement between the comparisons.
Kendall's w-statistic value ranges from zero (no agreement) to unity (complete agreement).

Consider an object **i** given a rank, $\mathbf{r_{ij}}$ by respondent number **j**; and assume that there are a total of **n** objects and **m** respondents. Then the total rank $\mathbf{R_i}$, given to object **i** is:

$$R_i = \sum_{j=1}^{m} r_{ij} \quad (2)$$

The value of these total ranks, $\overline{R}$ is,

$$\overline{R} = \frac{1}{2} m(n+1) \quad (3)$$

The sum of the squared deviations, $\mathbf{S_d}$ is given as,

$$S_d = \sum_{i=1}^{n} \left(R_i - \overline{R}\right)^2 \quad (4)$$

Kendall's w statistic is defined by Equation (5) [23],

$$w = \frac{12S_d}{\left[m^2 n\left(n^2 - 1\right)\right]} \qquad (5)$$

Principal Component Regression Analysis (PCR)

Principal component regression is a regression technique that is based on Principal Component Analysis (PCA). It considers regressing the outcome (the dependent variable) on a set of independent variables based on a standard linear regression model. Principal Component Regression basically involves two steps:

i) Application of PCA to decompose the independent variables(x) into an orthogonal basis (i.e. principal components or factor components), and select a subset of those components as the variables to predict the dependent variable(y).

ii) Construction of linear regression between the parameters on the factors most correlated with y.

The variables' coefficient is the factor loading [25].

$$Y_j = a_{j1}X_1 + a_{j2}X_2 + a_{j3}X_3 + ... + a_{jm}X_m + u_j Z_j ; \quad \left(j = 1, 2, 3, ..., n\right) \qquad (6)$$

where Y_j = variable observed which is described by the linear progression of generic factors (X_1, X_2, X_3,…, X_m), and $u_j Z_j$ = unique factor.

Data collected with respect to total quality management practices and effects to total quality management was used for model development employing Principal Component Regression (PCR) analysis. This was to identify the key performance indicators and their significant effects to total quality management. The developed models looked at the effect of the identified key business performance indicators from two perspectives:

Perspective I: Importance of the indicators on total quality management; and

Perspective II: The place of effective practice to the identified indicator on total quality management.

From the collected data on total quality management practices, the identified indicators were the independent variables. These indicators include management leadership = x_1; resource management = x_2; measurement and feedbacks = x_3; continuous improvement = x_4; system and processes = x_5; education and training = x_6 and work culture = x_7. While the dependent variable was the effect of total quality management = y on business performance.

The barriers to total quality management were evaluated from the data obtained using the percentage point scoring system. In the point scoring system applied in this study "Strongly Agree [SA]", "Agree [A]", "Neutral [N]", "Disagree [D]", and "Strongly Disagree [SD]" were given the weightings 5, 4, 3, 2, and 1, respectively. Kendall's Coefficient of Concordance (w-statistic) and principal component analysis were two statistic tools applied to the data obtained.

RESULTS AND DISCUSSION

Tables 1 and 2 show some of the data collected. The complete questionnaire from which the data was obtained is shown in the appendix. The data obtained from Engineering, Procurement and Construction (EPC) oil and gas servicing companies is presented in Table 1 while that obtained from PAF oil and gas servicing companies are presented in Table.

Also, Tables 4.2 and 4.3 present data collected on total quality management practices by respondents from sampled EPC and PAF serving workers, respectively. Furthermore, data collected on the effect of total quality management from EPC and PAF serving workers, respectively is presented by Figures 4.5 and 4.6.Data on the perception of respondents from the sampled EPC and PAF serving workers is present by Figures 4.7 and 4.8.

Table 1: Data collected on total quality management practices compliance by respondents (EPC oil servicing workers)

MANAGEMENT LEADERSHIP	CODE	VL	L	M	H	VH
Top management ensures that every employee knows the company's mission and business objectives.	ML.1	1	4	3	5	10
Top management strongly promotes staff involvement in quality management and improvement activities	ML.2	7	0	4	6	6
RESOURCE MANAGEMENT						
Employees are given information and training they need to do the job effectively.	RM.1	2	2	8	4	7
Employees are given tools they need to do the job effectively.	RM.2	2	3	4	1	13
MEASUREMENT AND FEEDBACK						
Customer satisfaction level are measured and monitored.	M&F.1	5	2	5	2	9
Information on quality and customers are collected and analyzed.	M&F.2	7	1	3	2	10
CONTINUOUS IMPROVEMENT						
There is a quality improvement coordinating body (e.g. quality department).	CI.1	8	4	2	2	7
Quality improvement tools and techniques are widely used.	CI.2	1	2	6	4	10
SYSTEM AND PROCESSES						
Systems and procedures for quality assurances are implemented.	S& P.1	1	1	11	3	7

Table 2: Data collected on total quality management practices compliance by respondents (PAF oil servicing workers)

MANAGEMENT LEADERSHIP	CODE	VL	L	M	H	VH
Top management ensures that every employee knows the company's mission and business objectives.	ML.1	1	4	3	3	8
Top management strongly promotes staff involvement in quality management and improvement activities	ML.2	7	0	4	2	6
RESOURCE MANAGEMENT						
Employees are given information and training they need to do the job effectively.	RM.1	2	2	8	5	2
Employees are given tools they need to do the job effectively.	RM.2	2	3	4	6	4
MEASUREMENT AND FEEDBACK						
Customer satisfaction level are measured and monitored.	M&F.1	5	2	5	3	4
Information on quality and customers are collected and analyzed.	M&F.2	7	2	3	3	4
CONTINUOS IMPROVEMENT						
There is a quality improvement coordinating body (e.g. quality department).	CI.1	8	4	2	1	4
Quality improvement tools and techniques are widely used.	CI.2	2	3	3	4	7
SYSTEM AND PROCESSES						
Systems and procedures for quality assurances are implemented.	S& P.1	1	1	7	3	7
Internal data collection system is established.	S& P.2	3	4	2	4	6

Kendall's Coefficient of Concordance was applied on the collected data in order to evaluate the opinions of respondents on Total Quality Management and the results are presented in Table 3. The pipeline and fabrication oil and gas servicing companies have a higher degree of agreement amongst the sampled workers on total quality management (57.75%) as against the EPC oil and gas servicing companies (35.5%) as indicated by w value.

Table 3: Kendall's coefficient of concordance analysis and output

QUESTIONNAIRE CODE	Engineering Procurement and Construction (EPC) Servicing Companies			PAF Servicing Companies		
	R_i	$\overline{R}$	$\left(R_i - \overline{R}\right)^2$	R_i	$\overline{R}$	$\left(R_i - \overline{R}\right)^2$
Op.TQM.1	97	126.5	870.25	65	104.5	1560.25
Op.TQM.2	105	126.5	462.25	66	104.5	1482.25
Op.TQM.3	97	126.5	870.25	70	104.5	1190.25
Op.TQM.4	85	126.5	1722.25	61	104.5	1892.25
Op.TQM.5	79	126.5	2256.25	59	104.5	2070.25
Op.TQM.6	89	126.5	1406.25	72	104.5	1056.25
Op.TQM.7	87	126.5	1560.25	59	104.5	2070.25
Op.TQM.8	70	126.5	3192.25	68	104.5	1332.25
Op.TQM.9	95	126.5	992.25	71	104.5	1122.25
Op.TQM.10	80	126.5	2162.25	46	104.5	3422.25
TOTAL			15494.5			17198.5
w	0.3550 (35.50%)			0.5775(7.75%)		

Tables 4, 5 and 6 show respectively summary statistics of variables, the resultant Eigen values on the application of PCR on the variables and the correlation between the resultant factors and the variables based on the perspective I for EPC oil and gas servicing companies. The corresponding results for PAF oil and gas servicing companies are shown in Tables 7, 8 and 9 respectively. A scree plot employed for factor extraction is only shown for the EPC companies in Figure 1.

Table 4: Summary statistics of variables for EPC companies based on perspective I

Variable	Minimum	Maximum	Mean	Std. deviation
TQM = y	82.00	97.00	90.18	4.05
Management leadership = x_1	73.00	96.00	87.17	5.39
Resource management = x_2	75.00	89.00	81.75	3.14
Measurement and feedback = x_3	66.00	77.00	72.60	2.74
Continuous improvement = x_4	65.00	89.00	76.33	5.39
System and processes =x_5	71.00	83.00	77.00	3.22
Education and training = x_6	70.00	82.00	76.00	2.68
Work culture = x_7	77.00	82.00	80.00	1.18

Table 5: Eigenvalues for EPC companies based on perspective I

	F1	F2	F3	F4	F5
Eigenvalue	4.1664	1.6038	0.9599	0.2671	0.0028
Variability (%)	59.5201	22.9111	13.7127	3.8157	0.0403
Cumulative %	59.5201	82.4312	96.1440	99.9597	100.0000

Table 6: Correlation between variables and factors for EPC companies based on perspective I

Variable (Performance indicators)	**F1**	**F2**	F3	F4	F5
Management leadership = x_1	0.7586	0.3353	-0.3740	0.4150	0.0019
Resource management = x_2	-0.6580	-0.3076	0.6292	0.2766	-0.0007
Measurement and feedback = x_3	-0.6833	0.7242	0.0836	-0.0137	0.0395
Continuous improvement = x_4	-0.7293	-0.6458	-0.1922	0.1181	0.0139
System and processes =x_5	0.7261	0.3355	0.5997	0.0228	-0.0060
Education and training = x_6	0.9621	-0.2348	0.1251	-0.0576	0.0179
Work culture = x_7	-0.8405	0.5363	-0.0701	0.0204	-0.0266

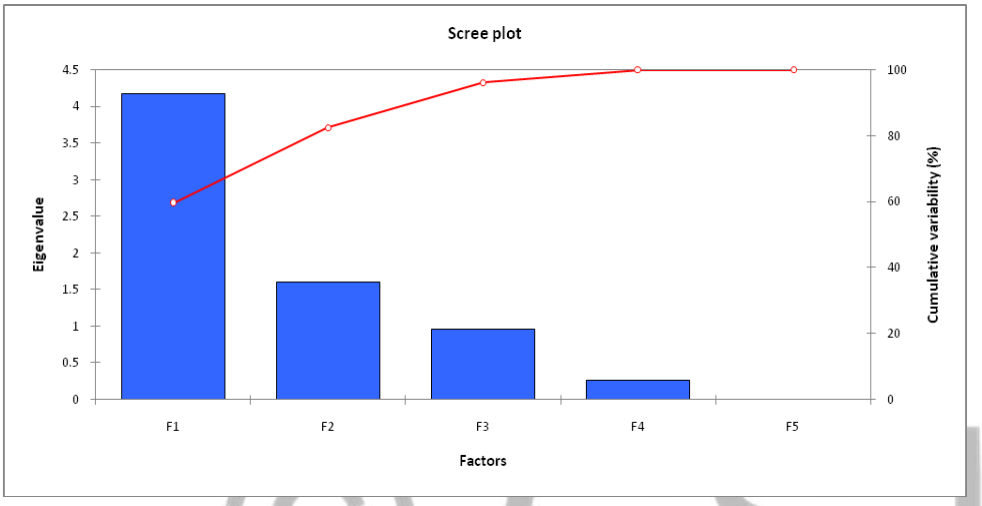

Figure 1: Scree plot for factor extraction for EPC companies

Table 7: Summary statistics of variables for PAF companies based on perspective I

Variable	**Minimum**	**Maximum**	**Mean**	**Std. deviation**
TQM = y	60.00	72.00	65.55	3.88
Management leadership = x_1	57.00	71.00	64.17	3.88
Resource management = x_2	55.00	65.00	61.00	2.49
Measurement and feedback = x_3	52.00	66.00	57.40	3.45
Continuous improvement = x_4	46.00	68.00	56.67	4.93
System and processes =x_5	54.00	71.00	61.25	4.11
Education and training = x_6	55.00	59.00	56.33	1.03
Work culture = x_7	59.00	64.00	61.33	1.13

Table 8: Eigenvalues for PAF companies based on perspective I

	F1	**F2**	**F3**	**F4**	**F5**
Eigenvalue	3.0623	2.1332	1.7282	0.0762	0.0001
Variability (%)	43.7477	30.4745	24.6883	1.0879	0.0015
Cumulative %	43.7477	74.2222	98.9105	99.9985	100.0000

Table 9: Correlation between variables and factors for PAF companies based on perspective I

Variable (Performance indicators)	F1	F2	F3	F4	F5
Management leadership = x_1	-0.7449	-0.2565	0.6105	0.0810	0.0072
Resource management = x_2	0.3942	0.0505	0.9111	0.1094	-0.0050
Measurement and feedback = x_3	-0.3326	-0.6967	-0.6064	0.1903	-0.0023
Continuous improvement = x_4	0.9963	-0.0061	-0.0620	0.0591	0.0030
System and processes =x_5	-0.3921	0.9148	0.0219	0.0939	-0.0014
Education and training = x_6	0.8765	0.4067	-0.2417	0.0891	0.0038
Work culture = x_7	-0.5717	0.7597	-0.3080	0.0343	0.0004

The range of the mean, standard deviation, maximum and minimum weighted values of the data employed by PCR in order to assess the importance of the key performance indicators on total quality were 90.18 – 72.6, 5.39 – 1.18, 97.00 – 77.00 and 82.00 – 65.00, respectively for EPC companies as presented in Table 4. The corresponding values for PAF companies presented in Table 7 are 65.54 – 56.33, 4.92 – 1.03, 72.00 – 59.00, 60.00 – 46.00 respectively. Table 5 shows that the resultant Factor one (F1) accounts for only 59.52% for EPC companies, while Factors 1, 2, and 3, cumulatively accounts for about 96.144% of the entire data sets. But for PAF companies, Factors 1, 2, and 3 cumulatively accounts for 98.9% of the entire data set as in Table 8. This implies that one could make prediction with data associated with Factors 1, 2, and 3 alone and achieve about 96% precision with respect to the whole data for EPC companies and 98% precision with respect to PAF companies. For EPC companies, Factor 1 reflects data majorly associated with "MANAGEMENT LEADERSHIP = x_1", "SYSTEM AND PROCESSES = x_5", and "EDUCATION AND TRAINING = x_6", while Factor 2 reflects data majorly associated with "MEASUREMENT AND FEEDBACK = x_3" and "WORK CULTURE = x_7". Furthermore, Factor 3 reflects majorly data associated with "RESOURCE MANAGEMENT = x_2" and "SYSTEM AND PROCESSES = x_5". For PAF companies, the influences on each of the factors can be clearly seen from Table 9. For instance, Factor 1 reflects data majorly associated with "CONTINUOS IMPROVEMENT = x_4" and "EDUCATION AND TRAINING = x_6".

Based on perspective I (The place of effective practice of the identified indicator to total quality management), summary statistics of variables, the resultant Eigen values on the application of PCR on the variables and the correlation between the resultant factors and the variables are all shown for EPC companies in Tables 10, 11 and 12 respectively while the correlation between the resultant factors and the variables are shown in Table 13 for PAF companies. Using EPC companies, the resultant R^2 value of the regression between TQM and the performance indicators was 0.5865 (58.65%) while for PAF companies, the resultant R^2 value was 0.4434 (44.34%).

Table 10: Summary Statistics of Variables for EPC companies based on perspective II

Variable	**Minimum**	**Maximum**	**Mean**	**Std. deviation**
TQM = y	82.00	97.00	90.18	4.05
Management leadership = x_1	65.00	78.00	72.33	4.11
Resource management = x_2	68.00	87.00	79.25	4.48
Measurement and feedback = x_3	59.00	80.00	67.20	5.20
Continuous improvement = x_4	75.00	79.00	77.00	0.89
System and processes =x_5	69.00	83.00	75.50	3.15
Education and training = x_6	74.00	84.00	78.67	2.25
Work culture = x_7	71.00	82.00	76.33	2.46

Table 11: Eigenvalues for EPC companies based on perspective II

	F1	F2	F3	F4	F5
Eigenvalue	2.9264	2.1869	1.6493	0.2373	0.0001
Variability (%)	41.8057	31.2415	23.5612	3.3905	0.0011
Cumulative %	41.8057	73.0473	96.6084	99.9989	100.0000

Table 12: Correlation between variables and factors for EPC companies based on perspective II

Variable (Performance indicators)	F1	F2	F3	F4	F5
Management leadership = x_1	-0.4851	0.7336	-0.2809	0.3842	0.0005
Resource management = x_2	-0.7811	0.5827	0.0338	-0.2215	0.0057
Measurement and feedback = x_3	0.8447	-0.3208	0.3941	0.1682	0.0061
Continuous improvement = x_4	-0.5262	-0.0500	0.8474	0.0506	-0.0012
System and processes =x_5	0.6999	0.7099	-0.0222	-0.0757	-0.0005
Education and training = x_6	-0.1416	-0.5487	-0.8239	0.0044	0.0019
Work culture = x_7	-0.7620	-0.6315	0.1286	0.0636	0.0006

Table 13: Correlation between variables and factors for PAF companies based on perspective II

	F1	F2	F3	F4	F5
Management leadership = x_1	-0.3681	0.5837	-0.4142	0.5935	-0.0091
Resource management = x_2	-0.8052	0.4218	-0.2110	-0.2342	0.2729
Measurement and feedback = x_3	0.3310	-0.4434	0.7353	0.3034	0.2471
Continuous improvement = x_4	0.6284	0.7360	0.2490	-0.0369	-0.0112
System and processes =x_5	0.0076	0.8388	0.5374	-0.0873	0.0029
Education and training = x_6	-0.5818	0.2016	0.7767	0.0207	-0.1308
Work culture = x_7	0.8465	0.4132	-0.3241	-0.0409	0.0774

Taking perspective II which has to do with the effective practice of the key business performance indicators to total quality management, the cumulative variability of the resultant factors 1, 2, and 3 with respect to EPC companies were 96.61 as in Table 10. Factor 1 accounted majorly for "MEASUREMENT AND FEEDBACK = x_3", while Factor 2 reflected data majorly associated with "MANAGEMENT LEADERSHIP = x_1", RESOURCE MANAGEMENT = x_2", and "SYSTEM AND PROCESSES = x_5". Factor 3 accounts for data majorly associated with "CONTINUOS IMPROVEMENT = x_4"as in Table 12. For PAF companies, Factor 1 accounted for majorly data associated with "WORK CULTURE = x_7". Also, Factor 2 reflected data strongly associated with "CONTINUOUS IMPROVEMENT = x_4" and "SYSTEM AND PROCESSES = x_5" while Factor 3 was with "MEASUREMENT AND FEEDBACK = x_3" and "EDUCATION AND TRAINING = x_6" as in Tale 13. From perspective II, the resultant R^2values of the regression between TQM and the performance indicators were 0.5934 (59.34%) and 0.4374 (43.74%) for EPC and PAF companies respectively.

Tables 14 and 15 present the evaluation of the respondents' response on the barriers to total quality management using the percentage point Scoring system for EPC and PAF companies respectively. The major barriers to total quality management within the sampled companies are identified.

Table 14: Evaluation of barriers to total quality management for EPC oil servicing companies

Barriers to TQM	SD 1	D 2	N 3	A 4	SA 5	Total [T]	Total Point Score [TPS]	% Point Score $\frac{TPS}{5\times T}\times 100$
Lack of top mgt. commitment	2	1	0	1	19	23	103	89.57
Lack of customer focus.	1	3	2	2	15	23	96	83.48
Lack of vision.	1	3	3	4	12	23	92	80.00
Lack of resources	4	2	2	1	14	23	88	76.52
Lack of systems and structures for TQM activities.	2	5	3	2	11	23	84	73.04
Costly consultancies, training programs	1	3	3	5	11	23	91	79.13
Training with no purpose.	2	2	2	12	5	23	85	73.91
Lack of rewards and recognition.	5	3	2	5	8	23	77	66.96

Lack of effective measurement criteria.	5	3	1	2	12	23	82	71.30
Lack of evaluation procedures and benchmark indices.	2	3	3	4	11	23	88	76.52
Lack of understanding.	3	3	1	1	15	23	91	79.13
Lack of preparation	3	3	2	3	12	23	87	75.65
Resistance to change	2	3	3	5	10	23	87	75.65

Table 15: Evaluation of Barriers to Total Quality Management for PAF oil servicing companies

Barriers to TQM	**SD**	**D**	**N**	**A**	**SA**	**Total**	**Total Point Score[TPS]**	**% Point Score**
	1	**2**	**3**	**4**	**5**	**[T]**		$\frac{TPS}{5\times T}\times 100$
Lack of top mgt. commitment	3	3	3	4	6	19	64	67.37
Lack of customer focus	1	2	3	3	10	19	76	80.00
Lack of vision	2	2	3	7	5	19	68	71.58
Lack of resources	1	1	3	3	11	19	79	83.16
Lack of systems and structures for TQM activities	2	4	4	3	6	19	64	67.37
Costly consultancies, training programs	2	3	3	3	8	19	69	72.63
Training with no purpose	1	2	2	5	9	19	76	80.00
Lack of rewards and recognition	2	2	3	4	8	19	71	74.74
Lack of effective measurement criteria	2	4	4	2	7	19	65	68.42
Lack of evaluation procedures and benchmark indices	2	3	2	4	8	19	70	73.68
Lack of understanding	2	2	2	2	11	19	75	78.95
Lack of preparation	2	4	3	3	7	19	66	69.47
Resistance to change	3	3	3	4	6	19	64	67.37

Conclusions

The impact of total quality management on performance of oil servicing companies in Port Harcourt was carried out in this work. It was observed that the major quality management initiatives employed by the sampled companies were; establishing measures of quality progress, development of a quality system and Setting up a quality department. The PAF service companies have a higher degree of agreement on total quality management practices. This is because PAF companies have higher level of awareness of TQM and its practices.

The following TQM practices: Measurement And Feedback, Continuous Improvement, Education and Training, Resource Management, Measurement and Feedback, and , System and Processes Improvement have more positive influences on the performance of sampled Companies. Increased customer satisfaction, Reduced Product/Service defect, Reduced Customer Complaints and Financial Improvement were achieved from implementing TQM practices among sampled companies. Lack of top management commitment and lack of resources were the major barriers to TQM implementation among sampled companies. More awareness programs and trainings should be made available to the respective top management staff on the importance and effect of Total quality management on performance of the organization.

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