The Practice of Total Quality Management in Selected Laboratories in Port Harcourt, Nigeria

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Abstract

The objective of this study is to determine the extent of total quality management practice in selected laboratories in Rivers State, Nigeria. The data for the study were collected from 600 laboratory personnel using a self-developed, pre-tested, validated and reliable questionnaire. The participants were from the universities, industries, government and private owned medical laboratories. The results were standardized to 100%. The desired extent of total quality management practice was benchmarked at greater than 75%. The results of this study showed that there was below 75% in the extent of total quality management practice in the selected laboratories (59.64±6.72) in Port Harcourt, Nigeria. The extent of total quality management practice was below the expected standard. Efforts should be made to improve the extent of laboratory total quality management in Port Harcourt metropolis, Nigeria. This can be achieved through organized trainings, re-trainings, advocacy, customers and employees focus, and aggressive top management involvement on laboratory total quality management system.

Introduction

Nowadays, trade across countries and the need for a competitive edge in business have made organizations to see the radical necessity for total quality management. Total quality management (TQM) is one of the most prominent developments in management for the past two decades (Al-Shdaifat, 2015); and focuses on customer satisfaction and improves organizational performance (Sadikoglu and Olcay, 2014). According to Topalovic (2015) total quality management has emerged as a response of successful companies to rapid and significant changes in the environment. The achievement and sustainability of competitive advantage in business is dependent on quality (Sureshchander, Rajendran and Anantharaman, 2002).

Literature Review

The concept of Total Quality Management (TQM) can apply to a firm-wide management philosophy for continuously improving the quality of the products, services and processes by focusing on the customers' needs and expectations (Sadikoglu and Olcay, 2014). Quality in its simplest form can be defined as meeting or exceeding customer's expectations (Besterfield, 2013). For quality management system (QMS) to be implemented effectively there must be support from the highest levels of management (Audu, and others, 2012). Few laboratories in Africa (only 340) are currently accredited. The majority of the accredited laboratories are in South Africa; only 28 (8.2%) are in sub-Saharan Africa. Of the accredited laboratories in South Africa, fewer than 10% are public sector laboratories (Gershy-Damet, 2010). Providing quality laboratory test results that are accurate, reliable, and reproducible will most effectively come through adopting laboratory standards that guide daily laboratory practices and institute a framework for quality management at the facility and network levels (Zeh and others, 2010).

Al-Shdaifat (2015) opined that research on total quality management system practices is limited especially in developing countries. Laboratory quality practices are uncommon in Nigeria like in other developing countries (Audu and others, 2012); many laboratories are faced with numerous challenges including improper record keeping, documentation of procedures and lack of internal auditing (Jegede and others, 2014). There is the need for these laboratories to institute periodic and systematic assessments like internal audits (Erasmus and Zemlin, 2009) so as to ensure quality standards generate reliable results and guarantee patient safety.

This research has the purpose of establishing the extent of laboratory quality management practices considering top management involvement, customer service and personnel management as

quality indicators; and how the socio-demographic variables of gender and length of service have effect on laboratory quality practice.

Materials and Method

Research design

This was a descriptive cross-sectional study.

Setting

Data were collected from university, industrial and medical laboratories in Port Harcourt metropolis of Rivers State Nigeria between July and October, 2016.

Sample

The population for the study consisted of all laboratory personnel in university, industrial and medical laboratories in Port Harcourt metropolis. Six hundred (600) laboratory personnel were used as sample for this study using purposive sampling technique.

Instrument

Self-developed, open and closed ended questionnaire which was of self-administering type was used by the researcher to collect data from the respondents. The questionnaire was pre-tested using twenty (20) laboratory personnel who were not part of the research sample. The extent of quality practice were rated as great extent (4), some extent (3), low extent (2) and no extent (1).

Procedure and Data Collection

The aim of the study and the details for responding to the questionnaire questions were explained to the respondents. The questionnaire was given to each participant with full instructions on how to answer the questions. A letter of introduction from the supervisor introducing the

researcher and the purpose of the study was used to gain access to and co-operation from the respondents.

Validity of the Instrument

The content validity of the instrument was done by the researcher's supervisors together with seven (7) subject matter experts in laboratory quality management, their criticisms and recommendations were taken note of. The questionnaire was adjusted and modified based on the noted recommendations.

Reliability of the Instrument

The reliability of the instrument for this study was tested using Cronbach alpha which gave 0.94.

Data Analysis

Microsoft Excel 2016 package and Statistical Package for Social Sciences (SPSS) version 22 were used for data analysis. Descriptive statistics of percentages and frequencies were used for the purpose of description. Mean and standard deviation were used to determine the extent of total quality management practice. The analysis of variance (ANOVA) was used to test the significant differences in top management involvement, customer service and personnel management at .05 level of significance. Quartile method was used for the result synthesis No Extent=<25%; Low Extent = 25-50%; Some Extent = 51-75%; Great Extent = >75%. Sqiures and others (2011) used quartile method in a similar study. The extent of total quality management practice was benchmarked at > 75% which corresponds to rate 4, which means that the optimum extent of total quality management practice was from above 75 percent (great extent, 4). $P < .05$ was considered as statistical significant. The results were standardized or scaled up to 100% for the purpose of description.

Results

Respondents' Characteristics

A total of 600 copies of the questionnaire were delivered to the laboratory personnel in the sampled population. Five hundred (516) copies of the questionnaire were correctly filled in by the participants giving 86% response rate. Table 1 below shows that 262 (50.8%) of the respondents were males while 254 (49.2%) were females. There was approximately equal number of males and females that participated in this research. Length of service was categorized into five groups. The highest length of service was > 20 years while the lowest length of service was < 4 years. The length of service with the highest number of participants was 7-10 years length of experience with a proportion of 119 (23.1 %) while the length of service with the lowest number of participants was < 4 years with a proportion of 73 (14.1%).

Table 1: **Social-demographic Data of Sample**

Demographic variables	Number of respondents	Percent
Gender		
Male	262	50.8
Female	254	49.2
Total	516	100.0
Length of Service		
<4 years	73	14.1
4 - 6 years	106	20.5
7 - 10 years	119	23.1
11 - 20 years	111	21.5
>20 years	107	20.7
Total	516	100.0

Table 2: Extent of Quality Practice Based on Gender of Workers (n=516)

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Male	262	59.3282	6.65234	.41098	46.51	78.62
Female	254	59.9539	6.79004	.42604	49.70	79.47
Total	516	**59.6362**	**6.72124**	.29589	46.51	79.47

Note: No Extent=<25%; Low Extent = 25-50%; Some Extent = 51-75%; Great Extent = >75%.

Table 2 above shows mean = 59.64 and standard deviation = 6.72. The mean value fell within 51 to 75 percent. This implies that there was some extent of quality practice based on gender. Males had a mean of 59.33 and standard deviation of 6.65 while females have a mean of 59.95 and standard deviation of 6.79. This further indicates that females had higher extent of laboratory quality practice than males in Port Harcourt Metropolis but with much variation than males.

Table 3: There is no Significance Difference in the Extent of Quality Practice Based on Gender of Workers Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig.(P-value)
Between Groups	50.490	1	50.490	1.118	0.291
Within Groups	23214.660	514	45.165		
Total	23265.151	515			

Table 3 above shows that the calculated F = 1.118 and the corresponding P= 0.291. There is no significant difference in the extent of quality practice based on gender (P>0.291). This implies that the laboratories do not differ in the extent of quality practice based on gender. It also indicates that the extent of quality practice was the same based on gender. This further implies that the differences in their means are likely due to chance variations.

Table 4: Extent of Quality Practice Based on Length of Service (n=516)

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
<4 years	73	54.2114	3.38536	.39623	46.51	73.54
4 - 6 years	106	57.5257	6.07967	.59051	50.81	76.67
7 - 10 years	119	59.4857	6.49009	.59495	51.23	78.62
11 - 20 years	111	62.5856	7.25913	.68901	53.83	79.47
>20 years	107	62.5360	5.58274	.53970	52.93	77.35
Total	516	**59.6362**	**6.72124**	.29589	46.51	79.47

Table 4 above shows a total mean value of 59.64 and a standard deviation of 6.72. This implies that there was some extent of laboratory quality practice based on length of service. Greater than 4 years length of service had a mean value of 54.21 and a standard deviation of 3.39; 4-6 years length of service had a mean value of 57.53 and a standard deviation of 6.08; 7-10 years length of service had a mean value of 59.49 and a standard deviation of 6.49; 11 – 20 years of length of service showed a mean of 62.59 and a standard deviation of 7.26. Over 20 years of length of service had a mean value of 62.54 and a standard deviation of 5.58. From the aforementioned, respondents with less than four (<4) years length of service had the least mean and least standard deviation. This implies that < 4 years had the least extent of laboratory quality practice with least variability. On the other hand, respondents with 11 to 20 years length of service had the highest mean value and the highest standard deviation. This implies that 11 -20 years had the highest extent of laboratory quality practice with the greatest variability. Consequently, the mean values for the different length of service fell within 51 to 75 percent. This indicates that there were some extent of practice for the different laboratories.

Table 5: There is a Significance Difference in the Extent of Quality Practice Based on Length of Service of Workers Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig.(P-value)
Between Groups	4488.469	4	1122.117	30.538	<0.0001*
Within Groups	18776.681	511	36.745		
Total	23265.151	515			

Data in Table 5 above reveal that the calculated F-value was 30.538 and the corresponding P< 0.0001, therefore P ≤ 0.05. This implies that the laboratories differ in the extent of quality practice based on length of service. This further reveals that length of service can influence extent of quality practice in these laboratories. This also reveals that the differences in their means are not likely due to chance but probably due to special cause variation. Pearson Chi-Square was further carried out to show which of these laboratories differs in Table 5

Tables 6: Pearson Chi-Square Statistic Based on Workers' Length of Service.

Core Business Area		Value	df	Asymp. Sig. (2-sided); P-value
Medical	Pearson Chi-Square	31.650[b]	8	<0.0001*
University	Pearson Chi-Square	34.784[c]	8	<0.0001*
Industrial	Pearson Chi-Square	3.785[d]	4	.436
Overall	Pearson Chi-Square	37.165[a]	8	<0.0001*

Table 6 above shows an overall P< 0.0001 .The table further shows that medical laboratories had a P< 0.0001 and university laboratories had a P< 0.0001 but industrial laboratories had a P= 0.436. Medical and university laboratories show significant differences while industrial laboratories do not show significance difference in the extent of quality practice based on length of service. This implies that length of service influence extent of quality practice in medical and university laboratories but not so in industrial laboratories. The results in the table above further reveals that personnel in medical and university laboratories have different extents of quality practice based on their lengths of service (P<0.05). This result further indicates that industrial laboratories have the same extent of quality practice based on length of service (P>0.05).

Table 7: Extent of Quality Practice Based on Top Management Involvement (n=516)

Core Business Area	Top Management Involvement			
	Min.	Max.	Mean±SD (%)	Extent of Practice
Medical	36.67	80.00	53.0891±9.743	Some extent
University	43.33	80.00	60.1755±9.606	Some extent
Industrial	40.00	80.00	61.1542±11.506	Some extent
Total	36.67	80.00	**56.1048±10.397**	**Some extent**

Table 7 above has total mean =56.10, standard deviation =10.40 which fell between 51 and 75 % (some extent). This implies that the average extent of total quality management practice based on top management involvement is to some extent.

Table 7 above further indicates that medical laboratories had a mean of 53.09 and a standard deviation of 9.74, but university laboratories had a mean of 60.18 and a standard deviation of 9.61 and industrial laboratories had a mean of 61.15 and a standard deviation of 11.51. Altogether the data show that the selected laboratories had some extent of quality practice because their means fell within 51-75%. This also implies that industrial laboratories with a mean of 61.15 showed the highest top management involvement while medical laboratories with a mean of 53.09 showed the least top management involvement. The data above imply that there were differences in mean in the extent of quality practice based on top management involvement.

Table 8: There is a Significance Difference in the Extent of Quality Practice Based on Top Management Involvement Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig.(P-value)
Between Groups	6539.622	2	3269.811	34.141	<0.0001
Within Groups	49132.620	513	95.775		
Total	55672.242	515			

Table 8 above shows that the calculated F-value was 34.141 and the corresponding P-value was <0.0001, and thus P <0.05. This implies that the laboratories differ in the extent of top management involvement in quality practice. This further implies that the differences in their means are not likely due to chance but probably due to the manipulation of the independent variables.

Table 9: Extent of Quality Practice Based on Customer Service (n=516)

Core Business Area	Customer Service			Extent of Practice
	Min.	Max.	Mean±SD (%)	
Medical	40.00	80.00	62.2933±9.9870	Some extent
University	36.00	80.00	64.2421±8.5303	Some extent
Industrial	44.00	80.00	61.8462±10.8653	Some extent
Total	36.00	80.00	**62.9884±9.5535**	Some extent

Results in Table 9 reveal a total mean = 62.99 and a standard deviation of 9.56.The mean value fell within 51-75% with a standard deviation of 9.56. This implies that the average extent of quality practice based on customer service was to some extent.

The table further shows that medical laboratories had a mean and standard deviation of 62.29 and 9.99 respectively while university laboratories had a mean of 64.24 with a standard deviation of 8.53 and industrial laboratories had a mean of 61.85 with a standard deviation of 10.87.This shows that the three types of laboratories had mean values within 51-75% which indicated that the laboratories individually had some extent of quality practice based on customer service. Furthermore, university laboratories with a mean of 64.24 had the highest extent of quality practice based on customer service whereas industrial laboratories had the lowest extent. The data above imply that there were differences in the extent of quality practice based on customer service.

Table 10: There is no Significance Difference in the Extent of Quality Practice Based on Customer Service Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig(P-value)
Between Groups	477.496	2	238.748	2.632	.073
Within Groups	46526.434	513	90.695		
Total	47003.930	515			

Data in Table 10 above show that the calculated F-value was 2.632 and the corresponding P-value was 0.073, therefore P >0.05. This implies that all the laboratories have the same extent of quality practice based on customer service, that is, there is no difference. This further implies that

the differences in their means are likely due to chance.

Table 11: Extent of Quality Practice Based on Personnel Management (n=516)

Core Business Area	Personnel Management			
	Min.	Max.	Mean±SD (%)	Extent of Practice
Medical	37.78	80.00	59.1262±11.2416	Some extent
University	46.67	80.00	61.5910±9.0181	Some extent
Industrial	40.00	80.00	57.9488±10.7400	Some extent
Total	37.78	80.00	**59.9745±10.5074**	Some extent

Table 11 show a total mean of 59.97 and a standard deviation of 10.51.This implies that there was some extent of personnel management. The standard deviation showed moderate variation in personnel management.

Medical laboratories had a mean of 59.13 and a standard deviation of 11.24 while university laboratories had a mean of 61.59 and a standard deviation of 9.02 but industrial laboratories had a mean of 57.95 and a standard deviation of 10.74.This implies that university laboratories had the highest personnel management while industrial laboratories had the poorest personnel management. Moreover, the results of their mean values further revealed that there was some extent of quality practice based on personnel management across the laboratory types. The data above imply that there were differences in the extent of quality practice based on personnel management.

Table 12: There is a Significant Difference in the Extent of Quality Practice Based on Personnel Management Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig.(P-value)
Between Groups	819.053	2	409.526	3.749	.024
Within Groups	56039.622	513	109.239		
Total	56858.675	515			

Data in Table 12 above show that the calculated F-value was 3.749 and the corresponding P-value was 0.024, therefore $P < 0.05$. This implies that the laboratories have different extents of personnel management. This further implies that the differences in their means are not likely due to

chance but probably due to special cause variation.

Table 13: Extent of Quality Practice among Selected Laboratories in Port Harcourt Using ANOVA (n=516)

Core Business Area	Total Extent of Quality Practice			
	Min.	Max.	Mean±SD (%)	Extent of Practice
Medical	46.51	79.47	60.0171±7.1396	Some extent
University	49.70	77.77	59.1151±5.7959	Some extent
Industrial	49.96	75.69	59.0508±7.9273	Some extent
Total	46.51	79.47	**59.6362±6.7212**	Some extent

Results in Table 13 reveal a total mean value of 59.64 which fell within 51 to 75 percent with a standard deviation of 6.72.This indicated some extent of quality practice among the selected laboratories.

Data above further show that medical laboratories had a mean of 60.02 with a standard deviation of 7.14 while university laboratories had a mean of 59.12 with a standard deviation of 5.80 and industrial laboratories had a mean of 59.05 with a standard deviation of 7.93.This indicated that medical laboratories had the highest extent of quality practice in Port Harcourt metropolis while industrial laboratories had the least extent of quality practice.

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Table 14: There is no Significant Difference in the Extent of Quality Practice Among Selected Laboratories in Port Harcourt Metropolis Using a One-Way Analysis Of Variance (ANOVA) (n=516)

	Sum of Squares	df	Mean Square	F	Sig. (P-value)
Between Groups	104.032	2	52.016	1.152	.317
Within Groups	23161.119	513	45.148		
Total	23265.151	515			

Table 14 above shows that the calculated F-value was 1.152 and the corresponding P-value was .317, therefore P >.05. This implies that there is no difference in the extent of quality practice, that is to say that there extent of quality practice was the same across the selected laboratories. This further implies that the differences in their means are likely due to chance.

Discussion

The findings of this study were discussed in relationship with the purpose of the study on laboratory total quality management practice in Rivers State Nigeria.

The study found that there was some extent of laboratory total quality management (TQM) practice (mean=59.64±6.72) based on gender which was below 75 percent (optimum extent). Females had a higher some extent of TQM practice (59.95±6.79) than males (59.33±6.65).This should be expected and not surprising because of the nature of females who are usually more organized and meticulous than males. TQM practice deals with meticulousness and attention to details. This is in line with the report of Al-Shdaifat (2015) who revealed that gender as a socio-demographic variable of total quality management implementation was below 60 %.Furthermore, this present study found no significant difference in the extent of TQM practice based on the gender of workers with P=0.291(P>0.05).This implies that both males and females had the same extent of TQM practice, the differences in their means could be attributable to chance not assignable cause. This was in consonance with Al-Shdaifat who found no significant difference in total quality management implementation based on gender and was supported by Cuenin (1986) who also found no significant difference between males and females (P=-363) in the implementation of quality indicator. However, this was in disagreement with the finding of Al-Lozi (2003) who found no significant difference related to sex.

The results of this study further indicated that there was some extent of TQM practice based on length of service (mean=59.64±6.72). Furthermore, 11-20 years length of service had the highest some extent of TQM practice (mean=62.59±7.26) while < 4 years had the least some extent (mean=54.21±3.39).of TQM practice. This result is not surprising. This is because newly employed personnel may not have enough experience to practice TQM compared to their fellow older

personnel. Most times following the tenets of job experience although not at all times people get better and more experienced the longer the stay on the job.These results were supported by the studies of other researchers. Al-Shdaifat (2015) reported that years of experience as a socio-demographic variable of total quality management implementation was below 60 %. Moreover, there was a significant difference in the extent of TQM practice among the different lengths of service with P<.0001.This is in agreement with the finding of Al-humedhi (2000) who in a similar study found a significant difference related to workers' level of experience and supported by the study of Taamneh (2001).

There was some extent (mean=56.10±10.40) of TQM practice based on top management involvement. This finding is expected and not surprising. This is because in Nigeria, most top management still perceive TQM as a waste of limiting resources. This finding is in agreement with Al-Shdaifat(2015) who found mean=47.1.64±23.60.This finding is in consonance with Shafiq (2015) who in his study found a lack of top management commitment and lack of communication as major issues which hinder the successful implementation of quality implementation initiatives. This is further in consistent with the study of Lee, Khong, Ghista and Mohammad (2006) who found that TQM implementation was very low and also affected by management and leadership. This is also in agreement with Fraga and others (2012) who found that management system scored 20 percent. In addition, there was a significant difference in the extent of TQM practice based on top management (P<.0001). This is also in consistent with Al-Shdaifat (P=.002).

The results of this study found that there was some extent (mean=62.99±9.55) of TQM practice based on customer service. This is supported by Lee and others (2006) who found that customer service was a contributor of very low implementation of TQM implementation. This finding is in line with Sisay and others (2015) who posited that lack of customer service

management was a contributing factor for not scoring star in their study. Taamneh (2001) in Al-Shdaifat (2015) posited that the philosophy of quality in health services has four features: output quality (meeting customer expectations), the use of prospective and retrospective methods for evaluating and monitoring, the responsibility of all and the focus on output, process and outcomes. Inversely, Al-Shdaifat (2015) in his study revealed that customer focus was the most implemented TQM principle (mean= 53.90 ±21.70).Relating Al-Shdaifat's result on customer focus to the present study, the result fell within some extent of TQM practice. In the present study, there was no significant difference in the extent of TQM practice (P=.073) but Al-Shdaifat found a significant difference in customer service with P<.001.

The findings of this study found that there was some extent of TQM practice which was below the benchmark/optimum extent of TQM for the study. This is indicative of a poor TQM practice. This is in line with other similar studies of Al-Shdaifat (2015); and Lee and others (2006); but at variance with the studies conducted by Taamneh (2001); and Al-Lozi (2003) among others.

The limitations of this study include the sample size together with the research design which was a cross-sectional and descriptive.

Conclusion

The present study concluded that there was some extent of TQM and this was poorly practiced in Port Harcourt Rivers State based on top management involvement, customer service and personnel management. There was a significant difference for top management involvement and personnel but no significant difference for customer service. Moreover, gender and length of service have some extent of contributions to TQM practice. However, there was no significant difference in the extent of TQM practice based on gender but there was a significant difference in the extent of

TQM practice based on length of service. The researcher recommends trainings on TQM, customer and employee focus, and aggressive top management involvement to laboratory total quality management

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