

THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

Maintenance Culture and Employee Performance of Beverage Firms in Edo State, Nigeria

Ohue Paul Itua

Ph.D. Student, Department of Business Administration
Nnamdi Azikiwe University, Awka, Nigeria

Dr. Akhator, P. A.

Academic Staff, Department of Business Administration,
Ambrose Alli University, Ekpoma, Nigeria

Abstract:

The broad objective of this paper is to determine the extent of relationship that exists between maintenance culture and employee performance of beverage firms in Edo state. The study was anchored on maintenance management theory propounded by Sack (1963). Survey research design was adopted for the study, a total population of ninety (90) was used for the study, census sampling method was used for the study because the population is a manageable size, the data collection tool employed by the researcher was the questionnaire, while the analysis of the data was done using the linear regression analysis. Results obtained from the test of the formulated hypothesis showed that the relationship between predictive maintenance and employee commitment is significant and positive since ($F = 6285.839$; $R\text{-squared} = 0.977$; $P < .05$). Based on the findings, the researchers concluded that there is a strong positive relationship between maintenance culture and employee performance of beverage firms in Edo state, Nigeria. Sequel to the conclusion, the researcher therefore recommended that heads of the production department of the companies in focus should ensure the enactment of a plant and maintenance schedule and a regular inspection of production equipment by the production department.

Keywords: Maintenance culture, predictive maintenance, employee performance, employee commitment

1. Introduction

In the last few decades, manufacturing firms have been forced to change their business models from closed systems to open systems. This shift was necessitated by the competitive nature of the work environment and a shift to a customer-based production system. An open system is characterized by advances in operational technologies, increased complexity and modern information and communication technology (Simoes, Gomes & Basin, 2011). The increasing complexity, scope, advances in technology, competitive nature of the business environment has made maintenance culture imperative for manufacturing firms. This gives credence to the determination of the nature of relationship that exists between maintenance culture and employee performance beverage firms in Edo state, Nigeria. Sodiki (2001) asserts that the concept maintenance culture in a typical manufacturing firm focuses on the design and implementation of a technical procedure that supports the prevention or correction of premature failure of productive systems with least cost and time without compromising the system performance and safety parameters. Traditionally, maintenance culture with its multifaceted activities has been important to manufacturing organizations. In recent years, the need for the application of different maintenance culture strategies by managers of production plants has shifted to the front burner (Simoes, Gomes & Yasin, 2011). Abuja and Chambal (2008) submit that some equipment maintenance strategies employed by production firms are breakdown maintenance, preventive maintenance, predictive maintenance, corrective maintenance, maintenance prevention, reliability centered maintenance, productive maintenance, computerized maintenance management systems and total productive maintenance. In today's open system method of operation by manufacturing firms, maintenance of machines and equipment has shifted from a narrowly defined perspective to a broader perspective. This is as a result of advancement in technology and the complexities of the business environment (Cooke, 2003). In such work environment, the role of the maintenance manager is critical. As such, maintenance managers are being called upon to integrate maintenance strategies with the performance of employees in other to meet the goals and objectives of the organization (Layout, 2007; Al-Najjar, 2007). Kinicki and Kreitner (2007) assert that employee performance is higher in happy and satisfied workers. Therefore, management should strive to ensure that they have a motivated workforce in other to attain firm targets. Employee performance can also be seen as the job-related activities of an employee and how well they are executed. Kinicki and Kreitner (2007) opine that some employee key performance indicators are: Turnover rate, time required to complete task, product quality, return on training investment, revenue per employee, 360-degree feedback score, employee core competency profile, employee engagement level, organizational citizenship behavior, human capital value added, job satisfaction, employee commitment and employee turn-over intention. Shrivastav (2005) suggests that the importance of maintaining the plant and equipment of manufacturing firms has made it important for

managers and employees of the production department to regularly engage themselves in training and development programs.

The competitive nature and complexities of the business environment has made the cost associated with the maintenance of production machines and equipment high (Parida & Kumar, 2006). In a manufacturing enterprise, maintenance related costs are estimated to be around twenty-five percent of the total operating cost (Komonen, 2002). Though the cost of maintaining production equipment and machines tends to be high, maintenance culture is an aspect of production associated with plant managers and employees. The production departments of the beverage firms used in Edo state are Nigerian bottling company, Benin plant and Seven up bottling company, Benin plant.

The researcher observed that the failure of some production managers and employees of the companies in focus to determine the condition of in-service equipment in order to estimate when maintenance should be performed could lead to the failure to detect fault early, inability to predict the time for repair, poor plant maintenance schedule and poor resource optimization. This by extension could lead to the regular break down of productive facilities which in turn impact the commitment level of employees in the focused firms. In the opinion of Bolaji and Adejuyigbe (2012), low degree of plant planning, inability of production managers to make spare parts available when necessary and the non-possession of the skill necessary for the estimation of specified time for equipment maintenance by production managers and employees could not just impact the performance level of employees, but the overall performance of a production firm. In a typical manufacturing firm, machine working in good condition could impact organizational productivity. In other words, the inability of production managers to timely detect the time machines should be maintained, could impact employee performance.

The broad objective of this study is to determine the extent of relationship that exists between maintenance culture and employee performance of beverage firms in Edo state, Nigeria.

Specifically, this study seeks to ascertain the type of relationship that exists between predictive maintenance and employee commitment of beverage firms in Edo state, Nigeria.

2. Review of Related Literature

2.1. Conceptual Review

2.1.1. Maintenance Culture

Maintenance of equipment and machines in modern manufacturing is becoming ever more important because of its effect on the performance of employees (Kutucuoglu, Hamali & Sharp, 2001). As a matter of fact, the maintenance culture of an organization could impact its corporate business objectives. As a result of the importance of maintenance culture, Muchiri, Pintelon, Gelders and Martin (2010) contend that maintenance managers need a good track of performance on maintenance process in order to ascertain the effect of equipment maintenance on the desired performance. Maintenance culture refers to a combination of all technical and associated administrative activities required to keep equipment, installations and other physical assets in the desired operating condition (Pinjala, Pintelon & Verreecke, 2006).

Sodiki (2001) asserts that the concept of maintenance culture in a typical manufacturing firm focuses on the design and implementation of a technical procedure that supports the prevention or correction of premature failure of productive systems with least cost and time without compromising the system performance and safety parameters. Developing good maintenance culture in business organizations requires a human resources organizational framework that supports a scheduled maintenance of tools and equipment. It has been found that a good production system is usually backed up by an effective maintenance system; therefore, evaluating maintenance culture is an important ingredient in the effort to enhance employee performance in an organization (Sodiki, 2001). Visser and Pretorius (2003) contends that the maintenance objectives of a manufacturing firm are related to attainment of production target at required quality, and within the constraints of the system condition and safety.

Ahuja and Khamba (2008) submits that some equipment maintenance strategies employed by production firms are breakdown maintenance, preventive maintenance, predictive maintenance, corrective maintenance, maintenance prevention, reliability centered maintenance, productive maintenance, computerized maintenance management systems and total productive maintenance. This study is centered on predictive maintenance

2.1.2. Predictive Maintenance

Predictive maintenance strategy is designed to help determine the condition of in-service equipment in order to estimate when maintenance should be performed. This approach promises cost savings over routine or time-based maintenance strategies. Thus, it is regarded as condition-based maintenance carried out as suggested by estimations of the degradation state of an item (Goriveau, Medjaher & Zerhouni, 2016; Mobley, 2016). The main promise of predictive maintenance is to allow convenient scheduling of equipment maintenance and to prevent unexpected equipment failures; thus, increasing plant availability. Some advantages of predictive maintenance strategy are increased life span of equipment, equipment safety and optimum spare parts handling. Some basic requirements for implementing predictive maintenance are data collection and preprocessing, early fault detection, fault detection, time to failure prediction, maintenance scheduling and resource optimization (Amruthnath & Gupta, 2018). Predictive maintenance has also been considered to be one of the driving forces for improving productivity and one of the ways to achieve just in time manufacturing (Amruthnath & Gupta, 2018). Predictive maintenance evaluates the condition of equipment by performing periodic (offline) or continuous (online) equipment. Predictive maintenance evaluates the condition of equipment by

performing periodic (offline) or continuous (online) equipment condition monitoring. The ultimate goal of the approach is to perform maintenance at a scheduled point in time when the maintenance activity is most cost-effective and before the equipment loses performance within a threshold. This results in a reduction in unplanned downtime costs because of failure where for instance costs can be in the hundreds of thousands per day depending on industry (Lee, Jun, Dragan, Hai, & Haitao, 2006).

In a nutshell, predictive maintenance entails the prediction of the future trend of the condition of production systems in order to avert operation breakdown in a manufacturing firm.

2.2. Employee Performance

Kotler and Armstrong (2002) assert that employee performance is measured in terms of the quality of output (goods and services) produced by the employee. Employee performance is normally looked at in terms of outcomes. However, it can also be looked at in terms of behavior (Armstrong, 2001). Wright and Geroy (2001) opine that employee performance is a function of organizational performance. Therefore, in order for an organization to achieve a high-performance level, employees have to be motivated so as to spur their performance. Kinicki and Kreitner (2007) assert that employee performance is higher in happy and satisfied workers. Therefore, management should strive to ensure that they have a motivated workforce in order to attain firm targets. Employee performance can also be seen as the job-related activities of an employee and how well they are executed. Kinicki and Kreitner (2007) opine that some employee key performance indicators are: Turnover rate, time required to complete task, product quality, return on training investment, revenue per employee, 360-degree feedback score, employee core competency profile, employee engagement level, organizational citizenship behavior, human capital value added, job satisfaction, employee commitment, job satisfaction and employee turn-over intention.

2.3. Employee Commitment

Employee commitment continues to be one of the most popularly researched subjects in the field of management (Chen & Francesco, 2003). Chen and Aryee (2007) affirmed that commitment of employees is an important instrument for improving the performance of the organizations. Adekola, (2012) defined commitment as being a positive evaluation of the organization and the organizations goals. According to Goutam (2004), employee commitment could be defined as a bond between an individual (the employee) and the organization (the employer). The level of employee commitment could be impacted by their involvement in the goal setting process of an organization. Miller and Lee (2001) identified three types of commitment; affective commitment, continuance commitment, and normative commitment.

2.4. Theoretical Framework

This study is anchored on Maintenance Management Theory Propounded by Sack (1963). The work of Sack (1963) was improved upon by Newborough (1967), Mann and Heintzelman (1976) and Kelly and Harns (1978). Visser (2002) observed that this theory is a relatively young academic discipline and the need for the adoption of an effective maintenance strategy by manufacturing firms has made the theory relevant to manufacturing firms. Maintenance management theory emphasizes the scheduled and timely maintenance of equipment and machines in order to avoid equipment break down and production down time in manufacturing firms. Visser and Pretorius (2003) contends that machine break down in a typical production firm could make employees idle and by extension lead to the inability of an enterprise to meet up with production targets.

This theory is relevant to the study because the adoption of effective maintenance strategies by the companies in focus could impact the performance level of employees.

2.5. Empirical Review

Venkateswaran (2017) examined the advanced methodologies that can be implemented to bring betterment of the process being used and to compute overall equipment effectiveness (OEE) to analyze maintenance performance of machine and to understand the quality standards and customer expectations over the products manufactured by manufacturing firms in India. The Research design taken for this study is Analytical research. The secondary data are collected from annual company records for the month July 16 to Dec 16. The various tools used for analyzing the data for this research paper is Pareto chart, Histogram, Why- Why analysis, Fish bone diagram, Pie chart. The findings of this research are OEE (Overall Equipment Effectiveness) has increased due to proper utilization of machine.

Ajiboye and Adedokun (2010) investigated maintenance engineering and productivity in a salt production firm in Osun State Nigeria. Descriptive survey research design was used for the study, questionnaire was the data collection tool employed while regression analysis was used to analyse the collected data. Findings revealed that machine with good working condition impacts the productivity of the firm in focus.

Nzewi, Chiekezie and Arachie (2016) determined the relationship between productive system maintenance and the performance of selected aluminium firms in Anambra state. Specifically, this study explored the type of relationship between maintenance autonomy and employee commitment. The study employed a correlation research design. It was anchored on the theory of structural empowerment. Pearson's product moment correlation co-efficient was used in analyzing the data. The findings revealed that maintenance autonomy has a significant positive relationship with employee Commitment.

Renganathan (2014) examined the impact maintenance of productive system practices has on the performance of selected manufacturing companies in Malaysia. Secondary source of data was utilized for the study, regression analysis

was used to analyse the collected data. The findings revealed that total maintenance practices impact the performance of the focused companies.

Bolaji and Adejuyigbe (2012) carried out a study on the evaluation of maintenance culture in manufacturing industries in the Akure metropolitan. Mathematical models were used to assess the performance of maintenance personnel in the four prominent manufacturing industries in Akure, Nigeria. The results obtained indicated that production machines are already getting old, thereby resulting to frequent breakdown. Maintenance analysis were generally poor due to poor review or monitoring of maintenance performance, low degree of planning, improper execution of preventive maintenance, lack of necessary spare parts, and inadequate maintenance personnel.

2.6. Gap in Knowledge

A review of empirical literature shows that the maintenance of production machines and equipment in manufacturing firms is not a new concept to researchers and scholars both in Nigeria and other parts of the world. However, none of the empirically revealed examined maintenance culture as it relates to employee performance of beverage firms in Edo state, Nigeria. This is the gap in knowledge that this study intends to fill.

3. Research Methodology

3.1. Research Design

The research design adopted for this study was the survey research design. It was used because of the nature of the study.

3.2. Population of Study

Company	Production Department
Nigerian Bottling Company, Benin plant.	53
Seven up Bottling Company, Benin plant.	37
Total	90

Table 1: Population of Employees in the Production Department of the Organizations of Study
Source: Human Resource Department of the Organizations of Study (January, 2021)

The study population was restricted to the production department of the companies in focus because of the nature of the study.

3.2. Sample Size and Sampling Technique

Census sampling was used for this study. It was chosen because the study population of 90 is a manageable size. Based on this, 90 copies of the questionnaire were distributed to the respondents of the production department in the companies of study.

3.3. Instrument of Data Collection

The data collection tool employed by the researcher was the questionnaire. It was designed on a five-point Likert Scale. Strongly Agree (SD), Agree (A), Strongly Disagree (SD), Disagree (D) and Undecided (U).

3.4. Validity of the Instrument

Validity is the extent to which an instrument measures what it intends to measure. The content and face validity test were used by the researcher.

3.5. Reliability of the Instrument

This is a measure of the consistency of a particular instrument employed by a researcher. The Cronbach's Alpha reliability test was used for the study. Suwannoppharat and Kaewsu, (2015) assert that a reliability coefficient of 0.696 and above is acceptable. Therefore, a benchmark of 0.696 was used for the study.

Reliability Statistics	
Cronbach's Alpha	N of Items
.871	5

Table 2: Scale: Reliability Statistics for Maintenance Culture

Since the Cronbach's Alpha score of the reliability statistics for maintenance culture 0.87 is greater than 0.696, it shows that the instrument is reliable.

Reliability Statistics	
Cronbach's Alpha	N of Items
.722	5

Table 3: Scale: Reliability Statistics for Employee Performance

Since the Cronbach's Alpha score of the reliability statistics for employee performance 0.72 is greater than 0.696, it shows that the instrument is reliable. The results of the reliability test were indications of the internal consistency of the instrument.

3.6. Method of Data Analysis

Regression analysis which was used to test the formulated hypothesis was done with E-views 10, while SPSS version 20 was used for the descriptive statistics.

4. Data Presentation, Analysis and Interpretation

4.1. Data Presentation

Analysis of Returned and Unreturned Questionnaire		
	Frequency	Percentage %
Returned Questionnaire (Valid)	72	80.00
Returned Questionnaire (Invalid)	07	07.78
Unreturned Questionnaire	11	12.22
Total Questionnaire Administered	90	100

Table 4: Table of Returned and Unreturned Questionnaire
Source: Field Survey, January (2021)

The table above shows that out of the 90 copies of the questionnaire administered, 72 valid questionnaires were retrieved. Based on that, 72 copies of the questionnaire were used for the analysis.

What is the type of relationship that exists between predictive maintenance and employee commitment of beverage firms in Edo state, Nigeria?

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Q1	72	1.00	5.00	3.5000	1.20924
Q2	72	1.00	5.00	3.2407	1.32663
Q3	72	1.00	5.00	3.4285	1.31380
Q4	72	1.00	5.00	3.3572	1.10312
Q5	72	1.00	5.00	3.2248	1.14635
Valid N (listwise)	72				

Table 5: Descriptive Statistics of the Analyzed Data (Predictive Maintenance)
Source: Field Survey, 2021

A bench-mark of 3.0 was used for the study. Since the mean values of all the questions for predictive maintenance are above 3.0, it shows that all the questions were acceptable for the study. Hence, they were all used for the study.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Q1	72	1.00	5.00	3.4630	1.22417
Q2	72	1.00	5.00	3.1767	1.43737
Q3	72	1.00	5.00	3.2630	1.51342
Q4	72	1.00	5.00	3.4373	1.38929
Q5	72	1.00	5.00	3.2963	1.34314
Valid N (listwise)	72				

Table 6: Descriptive Statistics of the Analyzed Data (Employee Commitment)
Source: Field Survey, 2021

A bench-mark of 3.0 was used for the study. Since the mean values of all the questions for employee commitment are above 3.0, it shows that all the questions were acceptable for the study. Hence, they were all used for the study.

4.2. Test of Hypothesis

The relationship between predictive maintenance and employee commitment of food and beverage firms in Edo state, Nigeria is significant and positive.

Dependent Variable: EMP_COM Method: Least Squares Date: 01/19/21 Time: 09:40 Sample: 1 72 Included Observations: 72				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.916327	0.197041	14.80063	0.0000
PRD_MAI	0.939184	0.011846	79.28329	0.0000
R-squared	0.977149	Mean dependent var		17.06711
Adjusted R-squared	0.976993	S.D. dependent var		6.717931
S.E. of regression	1.018979	Akaike info criterion		2.888810
Sum squared resid	152.6327	Schwarz criterion		2.929132
Log likelihood	-213.2164	Hannan-Quinn criter.		2.905192
F-statistic	6285.839	Durbin-Watson stat		1.915211
Prob(F-statistic)	0.000000			

Table 7: Descriptive Statistics of the Analyzed Data (Employee Commitment)

The result obtained from the regression analysis shows that predictive maintenance has significant effect on employee commitment ($\beta = 0.939$, $t = 14.80$, $P < .05$). Also, predictive maintenance is a predictor of employee commitment ($F = 6285.839$; $R\text{-squared} = 0.977$; $P < .05$). The predictor variable single handedly explained 97.7% of the variance in employee commitment, while the remaining 02.3% could be due to the effect of extraneous variables. The Durbin Watson value of 1.9 shows that there is no first order serial correlation. This makes the result respectable.

5. Discussion of Findings

Results obtained from the test of the formulated hypothesis showed that the relationship between predictive maintenance and employee commitment of food and beverage firms in Edo state, Nigeria is significant and positive. This is in agreement with the work of Ajiboye and Adedokun (2010). They investigated maintenance engineering and productivity in a salt production firm in Osun State Nigeria. Findings revealed that machine with good working condition impacts performance. In other word, predictive maintenance could impact employee commitment. Findings of the hypothesis are also in consonance with the work of Nzewi, Chiekezie and Arachie (2016). They determined the relationship between productive system maintenance and the performance of selected aluminium firms in Anambra state. The findings revealed that predictive maintenance has a significant positive relationship with employee Commitment. Findings of the study also corroborates the study of Venkateswaran (2017) who examined the advanced methodologies that can be implemented to bring betterment of the process being used and to compute overall equipment effectiveness (OEE) to analyze maintenance performance of machine and to understand the quality standards and customer expectations over the products manufactured by manufacturing firms in India. The findings of this research are OEE (Overall Equipment Effectiveness) could be increased by predictive maintenance. This could by extension impact employee performance.

6. Summary, Conclusion and Recommendation

6.1. Summary

Results obtained from the test of the hypothesis showed that the relationship between predictive maintenance and employee commitment is significant and positive since ($F = 6285.839$; $R\text{-squared} = 0.977$; $P < .05$).

6.2. Conclusion

Based on the findings, the researchers concluded that there is a strong positive relationship between maintenance culture and employee performance of beverage firms in Edo state, Nigeria. The findings of the study specifically revealed that the relationship between predictive maintenance and employee commitment of beverage firms in Edo state, Nigeria is significant and positive.

This study would contribute to existing literature in this area by making management of the studied beverage firms, other Nigerian manufacturing firms and manufacturing firms in other climes have an in-depth knowledge of the fact that maintenance culture could serve as a panacea for enhanced employee performance level. Also, this study could also be beneficial to future scholars who intend to carry out a related study.

6.3. Recommendations

The researchers made the following recommendations based on the findings of the study:

- Heads of the production department of the companies in focus should ensure the enactment of a plant and maintenance schedule.
- Regular inspection of production equipment by the production department.

7. References

- i. Adekola, B. (2012). The impact of organizational commitment on job satisfaction: A study of employees' at Nigerian universities. *International Journal of Human Resources Studies*, 2(2), 20-29.
- ii. Ahuja, I.P.S. & Khamba, J.S. (2008). Total productive maintenance: Literature review and directions. *International Journal of Quality and Reliability Management*, 25 (7), 709-756.
- iii. Ajiboye, T. K. & Adedokun, G. (2010). Maintenance engineering as a basic tool for maximum productivity. *The Pacific Journal of Science and Technology*, 11(2): 416-421.
- iv. Al-Najjar, B. (2007). 'The lack of maintenance and not maintenance which cost: A model to describe and quantify the impact of vibration-based maintenance on company's' business'. *International Journal of Production Economics*, 107, 260-273.
- v. Amruthnath, N., & Gupta, T. (2018). 'A research study on unsupervised machine learning algorithms for fault detection in predictive maintenance'. *Journal of Production Management*, 4 (2), 17-25.
- vi. Armstrong, M. (2001). *A handbook of human resources management practices*. London: Kogan Page Limited.
- vii. Bolaji, O.B. & Adejuyigbe, S.B. (2012). Evaluation of maintenance culture in manufacturing industries in Akure metropolitan of Nigeria. *Journal of Information Engineering and Applications*, 2 (3), 37-44.
- viii. Chen, Z. X., & Francesco, A. M. (2003). The relationship between the three components of commitment and employee performance in China. *Journal of Vocational Behavior*, 62, 490-510.
- ix. Chen, Z. X., & Aryee, S. (2007) Delegation and employee work outcomes: An examination of the cultural context of mediating processes in China. *Academy of Management Journal*, 50(1), 226-236.
- x. Cooke, F.E. (2003). 'Plant maintenance strategy: Evidence of four British manufacturing firms'. *Journal of Quality in Maintenance Engineering*, 9 (3), 239-249.
- xi. Goriveau, R., Medjaher, K. & Zerhouni, N. (2016). *From prognostics and health systems management to predictive maintenance: Monitoring and prognostics*. London: ISTE Ltd and John Wiley & sons, Inc.
- xii. Goutan, S. (2004). Determinants of career satisfaction among federal employees. *Paper presented at the seminar on public policy*. Georgia institute of technology, Georgia, USA.
- xiii. Kinicki, A. & Kreitner, R. (2007). *Organizational Behavior*. New York: McGraw-Hill.
- xiv. Komonen, K. (2012). 'A cost model of industrial maintenance for profitability analysis and benchmarking'. *International Journal of Production Economics*, 79, 15-31.
- xv. Kotler, P. & Armstrong, G. (2002). *Marketing: An introduction*. (6th ed.) London: Prentice- Hall.
- xvi. Kutucuoglu, K.Y. J., Hamali, Z.I. & Sharp, J.M. (2001). A framework for managing maintenance using performance measurement systems. *International Journal of Operations & Production Management*, 21(1/2), 173-195.
- xvii. Lee, J. Jun N., Dragan, D. Hai, Q. & Haitao, L. (2006). 'Intelligent prognostics tools and e-maintenance'. *Computers in Industry*, 57 (6): 478.
- xviii. Mann, L. (1976). *Maintenance management*. New York: Lexington books.
- xix. Miller, D. & Lee, J. (2001). 'The people make the process: Commitment to employees, decision-Making and performance'. *Journal of Management*, 27: 163-189.
- xx. Mobley, R. K. (2016). *An introduction to predictive maintenance (2nd ed.)*. London: Butterworth-Heinemann.
- xxi. Muchiri, P., Pintelon, L., Gelders, L. & Martin, H. (2010). Development of maintenance function performance measurement framework and indicators. *International Journal of Production Economics*, 6 (4), 13-21.
- xxii. Newborough, E. (1967). *Effective Maintenance Management: Organization*. New York: McGraw-Hill.
- xxiii. Nzewi, H.N, Chiekezie, O.M. & Arachie, A.E. (2016). Total productivity maintenance and performance of selected aluminium manufacturing companies in Anambra state. *Journal of Business and Management*, 18 (1), 67-73.
- xxiv. Parida, A. & Kumar, U. (2006). 'Maintenance performance measurement (MPM): Issues and challenges. *Journal of Quality in Maintenance Engineering*, 12 (3), 239-251.
- xxv. Pinjala, K.S., Pintelon, L. & Verreecke, A. (2006). An empirical investigation on the relationship between business and maintenance strategies. *International Journal of Production Economics*, 104, 214-229.
- xxvi. Renganathan, K. (2014). The impact of total productive maintenance practices on performance of selected manufacturing companies in Malaysia. Published Ph.D. dissertation: Centre for graduate studies, open university, Malaysia.
- xxvii. Sack, T.F.A. (1963). *Complete guide to building and plant maintenance*. New York: Prentice Hall.
- xxviii. Shrivastav, P. (2003). 'Industrial maintenance: A disciple in its own right'. *World Transactions of Engineering and Technology Education*, 4 (1), 107-110.
- xxix. Simões, J.M., Gomes, C.F. & Yasin, M.M. (2011) 'A literature review of maintenance performance measurement: A conceptual framework and directions for future research'. *Journal of Quality in Maintenance Engineering*, 17 (2), 116 - 137.
- xxx. Sodiki, J.I. (2001). Planning for manpower employment for scheduled maintenance work in Nigeria industries. *Nigerian Journal of Engineering Management*, 2(2) 5-8.

- xxxi. Venkateswaran, N. (2017). Total productive maintenance (TPM) practices adopted at manufacturing unit: An analysis. *Arabian Journal of Business and Management Review*, 7 (4), 313-218.
- xxxii. Visser, J.K. (2002). Maintenance management: An appraisal of current strategies, ICOMS 98, Paper 031.
- xxxiii. Visser, J.K. & Pretorious, M.W. (2003). The development of and performance measurement system for maintenance. *SA Journal of Industrial Engineering*, 14(1), 83-97.
- xxxiv. Wright, P. & Geroy, D. G. (2001). Changing the mindset: The training myth and the need for word-class performance. *International Journal of Human Resource Management*, 12,4, 586-600.

Appendix

Questionnaire Items on Maintenance Culture and Employee Performance

Options: Strongly Agree = SA, Agree = A, Undecided = UD, Strongly Disagree = SD, Disagree = D. Please tick (P) as it represents your view

Questionnaire Item for Independent Variable (Maintenance Culture)						
No	Predictive Maintenance	SA 5	A 4	UD 3	SD 2	D 1
1	There are maintenance engineers in your organization.					
2	There are engineers who can predict the right time for equipment maintenance in your organization.					
3	The engineers in your organization know the right time to replace equipment parts.					
4	The maintenance engineers of your organization study each production facility manual.					
5	There are instances where the maintenance engineers of your organization have predicted the right time for equipment maintenance.					
	Dependent Variable (Employee Performance)					
	Employee Commitment					
1	You empathize with your organization when there is loss.					
2	A times, you work beyond your normal work time.					
3	You see yourself as a part of the organization.					
4	You are always happy when your organization makes profit.					
5	You visit sick colleagues when you are told of their state.					

Table 8