



Effect of Total Productive Maintenance Initiative on Organizational Performance of Select Manufacturing Firms in Anambra State

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Abstract: *The study examined the effect of total productive maintenance initiative on organizational performance of select manufacturing firms in Anambra state. The problem of poor maintenance and neglects of equipment was the motivating factor for the research. The objectives of this study were basically to assess the effect of total productive maintenance initiative on organizational performance of select manufacturing firms. The study was anchored on Kanter (1977). theory of Structural Empowerment. The population of the study comprised of the manufacturing firm in Anambra state. A sample size of 100 employees was drawn from the population using purposive sampling of which 75 copies of questionnaires were duly completed and returned showing 75% response rate. Research hypotheses were tested using Analysis of variance (ANOVA) which was carried out with the aid of Statistical Package for Social Science (SPSS) version 23. Findings from the study revealed that total productive maintenance initiative has positive significant effect on organizational performance of select manufacturing firms in Anambra state. In view of the findings, the study therefore, recommends that firms should try as much as possible to include performance measurement index as a determinant of maintenance policy. This way the companies would be doing a lot to salvage the Nigerian business enterprises from chronic problems, which has become a mainstay in the life of the economy.*

Keywords: *Deposit Money Banks, Intellectual Capital, Organizational Culture, Sustainable Competitive Advantage*

INTRODUCTION

i. Background to the Study

TPM (Total Productive Maintenance) is approach for equipment maintenance that endeavors perfect production by reducing the rejection, proper maintenance and availability of equipment and focusing toward no defect. In addition it values a safe working environment with zero accidents. It can be considered as treatment to improve the performance of machines. It emphasizes proactive and preventative maintenance to maximize the operational efficiency of equipment (Vigneshwaran, Maran & Manikandan, 2015).

A cursory look at various infrastructures in a typical Nigerian society and indeed in all the third world nations, including roads, houses, company equipment, vehicles, others, one will

notice dilapidated buildings, abandoned equipment, broken vehicles, deplorable roads, and malfunctioning office equipment (Oseghale, 2018). This state of affairs depicts a society with little regard to or the complete absence of a maintenance and replacement cultures. Looking deeper in more organized companies and corporate organizations, such as general electric company of USA, Toyota Motors, Coca Cola etc different picture is likely to be observed. Generally, in this contemporary world of global competitiveness, evolving technologies, environmental and safety requirements, sensitivity towards total quality, and with various treats to company's performance (profitability), there is every need for industries to optimize their production system (Nzewi, Chiekezie and Arachie 2018).

Equally, as a result of manufacturing capabilities by peer companies, there is perceived escalating pressure upon manufacturing organizations to meet customer and corporate insatiable demands and expectations, as well as improving equipment efficiency availability and optimal performance. There has recently been a surge of concentration in maintenance within the business sector (Muyengwa and Marowa, 2015). This led Enofe and Aimienrovbiye (2010) to conclude that product and process flexibility as a means to meet customer demands are vital for today's companies to survive in business considering the competitive environment they operate. To achieve this goal in the face of bracing increased use of automation and mechanization, such as Flexible Manufacturing System (FMS), Just-In-Time (JIT), robot systems in today's industries, availability and efficiency of production equipments becomes a key issue in the manufacturing environment because possible breakdown is more likely to affect costly machine machinery and result to organizational loss, high cost of maintenance overheads, new equipment replacement, cost of breakdown etc production and product quality and invariably, its performance.

Availability notwithstanding comes with other challenges. Speed and accuracy are two scarce virtues that have to be inculcated into the fabrics of every organization. It becomes clear that no manufacturing firm, whether in private or public sector, can experience organisational growth or service indefinitely with such a careless maintenance and replacement attitude become of the high association between maintenance and firm performance.

Hence, there has to be effectiveness, efficiency in branding, high quality products and palatable packaging and these has to be linked with efficient machinery. These challenges come with their own risks and these have to be mitigated. These challenges obviously have a detrimental impact on performance if not handled with tact and urgency. Consequently, for the afore-mentioned challenges to be tackled, organizations have continuously shown a keen interest on investing on maintenance as a solution (Vollmann, Berry, Whybark & Jacobs, 2015).

ii. Theoretical Framework

This theory known as Structural Empowerment theory was propounded by Kanter (1977). Kanter maintained that the behavior of employees and their performance in the organization depend on how empowered and equip they are. Empowerment in this theory means the level of opportunity given to the employees for growth and mobility, the amount of power possessed by employees to access resources and information to carry out their duties as well as the kind of equipment available to them to carry out their function in an organization. This

theory states that when employees are provided with access to information, resources, support and the opportunity to learn and develop, then it can be said that such an organization promotes empowerment (Larkin, Ciepial, Stack, Morrison & Griffith 2008). The rationale for anchoring this study on the theory of Structural Empowerment is because part of the problem that contributed to frequent machine breakdown is probably lack of empowerment and support from the management. The operatives seemed not empowered to carry out simple maintenance activities and to exercise maintenance autonomy.

Wickramasinghe & Asanka (2016) investigate the effect of total productive maintenance (TPM) practices on manufacturing performance of textile and apparel manufacturing firms. A self-administered survey questionnaire was used for data collection. A total of 236 usable responses resulted in a 78 percent response rate from 30 respondents of textile and apparel firms. Correlation and regression analysis was performed using statistical package for social science (SPSS) software to identify the effect of TPM on manufacturing performance. The results show that all the TPM practices have positive and significant relationship with manufacturing performance and significantly improve cost effectiveness, product quality, on-time delivery and volume flexibility.

Kathleem & Roher (2018) investigate the relationship between Total Productive Maintenance (TPM) and manufacturing performance (MP) through Structural Equation Modeling (SEM). They found that TPM has a positive and significant relationship with low cost (as measured by higher inventory turn over), high levels of quality (as measured by higher levels of conformance to specifications), and strong delivery performance (as measured by higher percentage of on-time deliveries and by faster speeds of delivery). The study also revealed that the relationship between TPM and MP can be explained by both direct and indirect relationships. In particular, there is a significant and positive indirect relationship between TPM and MP through Just-In-Time (JIT) practices.

Nzewi, Chiekezie, and Arachie (2016) determine the relationship between Total Productivity 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. The evaluation, therefore advocated that management should empower the operatives by giving them necessary working resources to succeed in the maintenance activity. Effort should be geared towards avoiding stock out syndrome. In addition, state of the art equipment should be provided in order to ensure optimum level of coordination among the various departments in the organizations.

José, Jorge, Avelar-Sosa, I José, Juan & Julio (2018) examined the role of managerial commitment and TPM implementation strategies in its productivity benefits. The research proposes a structural equation model to integrate four latent variables: managerial commitment, preventive maintenance, total productive maintenance, and productivity benefits. In addition, these variables are related through six research hypotheses that are validated using collected data from 368 surveys questionnaires administered in the Mexican

manufacturing industry. Consequently, the model is evaluated using partial least squares. The results show that managerial commitment is critical to achieve productivity benefits, while preventive maintenance is indispensable to total preventive maintenance. These results may encourage company's managers to focus on managerial commitment and implement preventive maintenance programs to guarantee the success of total productive maintenance.

Ihueze, and Ebisike (2018) studied the impact of equipment effectiveness, availability and performance through the use of total productive maintenance in Apex Automated Manufacturing Industry, with the objectives of producing goods without reducing product quality, increasing product cost and to produce a low batch quantity of products at the earliest possible time with non defective products. The equipment parameters, such as the availability rate, the performance and the quality rates of the goods produced are considered while optimizing the Equipment Effectiveness (OEE) of a production system. Pareto principle and statistical models of downtimes were used to depict the most downtime factors. This study reported OEE of 22.4% and 23.5% for 2012 and 2013 years respectively in line with the world class recommended OEE is 85%. Pareto analysis showed that plane maintenance and machine failure / breakdown caused about 80% of total downtime. And the management and maintenance group should always target total implementation of TPM to bring the value of OEE to world class standard of 85%.

Krishnamoorthy (2014) studied the impact of total productive maintenance practices on manufacturing performance through secs/gem standard for electronic contract manufacturing companies. To achieve this integration process, a fast-track TPM implementation approach is required by re-engineering the TPM implementation process. The Re-Engineered TPM approach comprises of three TPM pillars (Asset Productivity (AP), Autonomous Maintenance (AM) and Planned Maintenance (PM)) instead of the original eight pillars. Apart from three TPM pillars, also included are SECS/GEM standard, direct and indirect labour utilisation hours, material and overhead cost. Based on the panel data analysis, the Hausman Test revealed that the Fixed Effects model was found to be the optimal model for this study. The result shows that six independent variables were significant, while one independent variable was not. The insignificant independent variable was SECS/GEM standard integration with Autonomous Maintenance. Further analysis was conducted through a qualitative study.

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) so as to analyze maintenance performance of machine and to understand the quality standards and customer expectations over the products manufactured. The Research design taken for this study was Analytical research. The secondary data were collected from annual company records for the month of July 16 to Dec 16. The various tools used for analysing the data for this research paper is Pareto chart, Histogram, Why- Why analysis, Fish bone diagram, Pie chart. The findings of this research is that OEE (Overall Equipment Effectiveness) has increased due to proper utilization of machine; In-process scrap gets reduced due to development of gauges for measuring the dimension near the machining area and inspection area near the machining center. The suggestion given to the management from this research is Cleaning and Inspection time and machine settings change-over time to be reduced to utilize

the machine as much as possible to meet the production target and to increase the OEE.

Vigneshwaran, Maran, & Manikandan (2015) studied impact of Total Productive Maintenance (TPM). The studied explicates the tangible and the intangible benefits achieved as a result of TPM implementation. In the end some concluding observations and directions for future research were stated. The review was done by studying the Total Productive Maintenance papers and identifying the tangible and intangible benefits of Total Productive Maintenance. This literature highlights the Total Productive Maintenance involvement in improving the Overall Equipment Effectiveness as well as employee's morale.

Fadly Hudin, Mustaffa, Rosli, Ong, & Fuzi, (2017) develop propose TPM tool as an important catalyst for continually seek for better maintenance performance and in turn against competitive advantage. By implementing prototype of TPM system, modern manufacturing companies will eliminate waste in operation activities such as to reduce maintenance cost, reduce time monitoring and control's, reduce defect, to reduce lead time, and reduce variation process and also improve quality product and good service for customer satisfaction. The included variables were safety, quality, cost, and performance efficiency. The study found a significant relationship between Total Productive Maintenance (TPM) Tool and manufacturing sector performance in Malaysia.

Sivaram (2017) studied Total Productive Maintenance As a result, organizational leaders have been striving to adopt strategies that would aid in facing the intensified competition. This studied reports the literature review which was conducted with the primary objective of identifying the contributions of researchers towards Total Productive Maintenance. This studied presents, the origin of researches on Total Productive Maintenance, early contributions of researches on Total Productive Maintenance and Case studies on Total Productive Maintenance. The study indicates that, Total Productive Maintenance is being adopted across many organizations in the world for enhancing the productivity. Presently Total Productive Maintenance is regarded as a world class strategy for maintenance activities.

Prasanth, Poduval, Jagathy Raj & Pramod (2015) examined Total Productive Maintenance Role of Interpretive Structural Modeling and Structural Equation Modelling in analyzing Barriers in its Implementation –A Literature Review on Total Productive Maintenance and the barriers in implementation of Total Productive Maintenance (TPM) were carried out. The study begins with a brief description of TPM and the barriers in implementation of TPM. Interpretive Structural Modeling (ISM) and its role in analyzing the barriers in TPM implementation was examined and explained in brief. Applications of ISM in analyzing issues in various fields are highlighted with special emphasis on TPM. The studied moves on to introduce the Structural Equation Modelling (SEM) and its role in validating ISM in analyzing barriers in implementation of TPM. The studied concludes with a gap analysis from the current literature, research which can be further carried out and expected its outcomes from the proposed research.

METHODOLOGY

According to (Adams,2010), research design describes a number of decisions which need to be taken regarding the collection of data even before the data is collected; A schematic guides

which directs a researcher in solving research problem. The research design that was adopted in this study is the survey design, Personal observation, interview and questionnaires were used in this study to seek clarifications and convenience on the part of the respondent given schedules. The study were carried out in the selected manufacturing firms in Anambra state. Due to the large population of the manufacturing firm in Anambra state, the researcher narrowed the study to 5 manufacturing firm such as Transport company of Anambra state, Innoson Nigeria Limited, Kates Association Industries Ltd, Pokobros food and chemical industries Ltd and Louis carter group Ltd. The researcher use purposive sampling method to distributed 20 copies of questionnaire to each of the firms making it a cumulative total of 100 questionnaires.

Two methods of data collection involving quantitative and qualitative method were adopted for this study. The quantitative method makes use of questionnaire and for the qualitative, a semi structural interview was conducted which serves as a supplementary data for the quantitative method which was subject to data analysis. The primary data generated through semi structural interview and questionnaire was collated and presented in the form of tables, frequency distribution and analyzed using the simple percentages. The quantitative data was further analyzed using the statistical package for social sciences (SPSS).

PRESENTATION AND ANALYSIS OF DATA

Survey Response Rate Equation

A total of 100 copies of the questionnaires were administered, out of which 75 were successfully retrieved after careful scrutiny, Twenty-five (25) questionnaires were disqualified because they were ineligible a response rate of 75% was recorded.

Respondents Demographic Variables

Age of Respondents: Interestingly, the respondents were top management in their early thirties and late fifties selected from the firms across the Anambra state Nigeria

Gender Distribution: The gender distribution constitutes a larger chunk in favour of male accounting for about 82.5%, while female account for about 17.5%

Rank: Majority of the respondents representing about 23.6% were B.sc holders while the least where PhD 5.5% and M.Sc 70.9%

Status: majority of the respondents ate married at the time of this study. Married were at 97.6% while single were 2.4

Test of Hypotheses

To further justify the results, ANOVA test was conducted to measure the impact of Total productive maintenance initiative on organizational performance in Anambra state. The results were shown in the ANOVA Table below;

Ho₁: Total productive maintenance initiative has no significant effect organizational performance in Anambra state

ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|---------|------|
| Between Groups | 293.995 | 4 | 73.489 | 241.453 | .001 |
| Within Groups | 31.428 | 71 | .163 | | |
| Total | 325.423 | 75 | | | |

Source: SPSS Version 20, 2020

The test table reveal that small significance value (F. sig<.05) indicate group differences. Since the F- value of 241.453 which has a significance of .001 is less than .05 (i.e .001<.05), Total productive maintenance initiative has no significant effect organizational performance in Anambra stat.

From the result of the analysis of the study, it was revealed that Total productive maintenance initiative has direct implications on manufacturing operations. Also aligning with the findings of this study is that of Maletic, Maletic, Al-Najjar and Gomiscek (2014) who carried out a study to examine the role of maintenance in improving company's competitiveness and profitability. Their results suggested that from respondents' points of view, Total productive maintenance practices related to condition based maintenance (CBM) approach represent the highest opportunity for improvement. Also, the most notable empirical results of the study showed that additional profit could be generated at weaving machine, especially if all unplanned stoppages and loss of quality due to decrease in the productivity would be prevented. If all unplanned stoppages are stopped through maintenance, then this will increase machine availability which will in turn boast the performance of the organization

CONCLUSION AND RECOMMENDATION

In concluding, the researcher would like to make a few remarks about the maintenance polices/practices of studied companies as regards organizational performances. Firstly, the researcher would like to remark that the replacement policies and practices fulfil the objective of motivating organization towards superior performance. The researcher would also like to commend the maintenance managers of various studied companies, who have been running their maintenance department on such a high skill even though their companies have not got a fully fledged maintenance department. However, the majority of the studied firms leave much to be desired in administration of maintenance program. If not, why wait for so long before establishing a full fledged maintenance department? Why wait for so long before engaging in capacity development of their maintenance personnel? Why wait for so long before making sufficient funds available for maintenance purposes? Why wait for so long before stopping the use of contractors for maintenance services? All this question and more have been or maybe answered in the course of this research work or further research studies. Finally, the researcher

would like to assert that Nigerians companies are not sensitive to maintenance culture, yet they complain of low productivity. They should try as much as possible to include performance measurement index as a determinant of maintenance policy. This way the companies would be doing a lot to salvage the Nigerian business enterprises from chronic problems, which has become a mainstay in the life of the economy.

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