

Lean Accounting and Waste Management of Nigerian Breweries: An Empirical Analysis

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Abstract

This work empirically examined the effect of lean accounting on waste management of Nigerian Breweries, using Champion Breweries as the case study. A survey research design was adopted in this study. The primary data used were collected through a structured questionnaire administered purposively to 50 workers in Champion Breweries. The data collected were analyzed using tables, simple percentages, descriptive statistics, correlation analysis and the hypotheses were tested using ordinary least square regression technique. The results of the analysis showed that lean accounting has significant effect on process waste management; significant but negative effect on product quality but insignificant effect on inventory waste management of Nigerian breweries. Thus the study concluded that the application of lean accounting can aid organization achieve efficient and effective waste management. The study recommended that companies should fully adopt lean manufacturing processes and lean accounting methodologies in order to enjoy the attendant benefits of waste reduction, product quality and customer retention, which ultimately maximize shareholders' wealth.

Keywords: Lean Accounting, Lean Manufacturing, Waste Management, Customers' Value, Target Costing.

1.0 Introduction

Companies around the world have evolved various methods to improve and maximize their value added activities. This is evidenced in the recent focus on customers' value rather than shareholders value which before now, was the ultimate objective of any business enterprise. Following this trend, companies try to change the manner in which they produce and deliver products and services in order to align with the competitive business environment. At first, these changes appear to be just mere programmes designed to make a company more efficient and effective by applying new production techniques and defined mode of service delivery. But when viewed more closely, it becomes clear that this new method known as lean manufacturing is not just another improvement programme but fundamentally new way of conducting business. A lean organization understands customers' value and focuses its key processes to continuously improve it. Lean thinking changes the way a company views its customers and seeks to maximize the value created for them while adding values to their activities by eliminating waste.

Traditional accounting systems such as full absorption costing were designed to support

mass production, top down command and control, departmental optimization and focused solely on shareholders' wealth creation. The principles of lean thinking are quite different from those of traditional management methods. Replacing the traditional manufacturing systems with modern ideas requires companies to review the processes and adopt modern approaches. Lean accounting seems to negate traditional cost and management accounting system which, according to Unah and Unweni (2017) ignores tangible non-financial performance measurement such as on-time delivery and customers' satisfaction. The failure of conventional cost reduction techniques to yield the expected result brought about the thinking toward the implementation of lean accounting principles.

The goal of lean accounting is to eliminate the non-value added components of any process and thus emphasize speed and quality regardless of cost. Waste reduction can help companies improve their overall profitability. This is a significant impact because companies that can maintain or improve production output use less capital. Hence lean companies can reinvest saved capital into their businesses and make additional improvements in the production process. Based on these facts, lean accounting may be used to reduce process and inventory waste, improve products quality as well as enhance company's public image. It is upon this note that the Institute of Management Accountants (2014) stresses that lean concept is becoming a prerequisite for firms to survive in the global economy where the main focus lies in creating customers' value that allows for creation of wealth for the shareholders. This has raised the awareness among companies' managements, on the importance of cost and waste reduction as well as customers' value maximization.

Several previous studies have revealed a gap between development of lean accounting methods and the reality of their application in working life. Unfortunately, prevailing accounting and management literature in the subject matter does not give much space to lean accounting as a means of reducing industrial waste. The lean accounting literature mostly consists of reports and studies focused on nature, objectives, methods and tools applied for production process or operation. In Nigeria, there have been very scanty researches on the effect of lean accounting on waste management. In addition to this, most of the researches are exploratory and not empirical and the effect of lean accounting on waste management is not really ascertained. Furthermore, some of the researches focused on manufacturing sector, health sector, oil and gas sector and very few on the brewing sector. It is against this backdrop that this research was undertaken to evaluate the effect of lean accounting on waste management of breweries in Nigeria, taking Champion Breweries Plc, Uyo as the case study.

2.0 Literature review

Lean accounting is a new accounting approach that emerged with the rise of business interest to embrace the lean thinking culture (Woehrle & Abou-Shady, 2010). It aims to measure the monetary impact of implementing lean improvement projects to business processes. Maskell & Baggley (2006) describe lean accounting to include simple accounting, visual performance measures, value stream boards, value stream costing, target costing, visual management, and box scores for decision making. Lean Accounting requires managers to stop thinking about production improvement in terms of short-term cost reduction, but to start thinking about customers' value and business growth. Lean accounting measures the monetary impact of implementing lean

improvement projects to business processes (Woehrle & Abou-Shady, 2010). It is a new accounting approach that emerged with the rise of business interest to embrace lean thinking culture.

Process waste encompasses all the wastes produced during beer production. Each stage of brewing processes produces waste. For every 1,000 tonnes of beer produced, 137 to 173 tonnes of waste may be created in the form of spent grain, trub (an unwanted material generated during wort production), waste yeast and Kieselguhr, main material used to filter the beer. Several technological advances in the last 20 years have provided the brewery industry huge services by lowering generation of by-products in the process. However, certain wastes common to beverage production such as brewer spent grains, residual brewing yeast and trub, hardly have the quantities formed reduced, due to the necessity of grain processing, the characteristics of chemical composition and treatment of raw materials used, and the need for microbial activity during fermentation (Priest & Stewart, 2006).

Inventory in brewing industry is sub-divided into three categories, just like any other inventory and these are inventory of raw-materials, work-in-progress inventory and finished goods inventory. Keeping control of inventory is important to lean accounting. In breweries, raw-materials need to be kept in top quality condition and be on hand when required. Many firms are using lean inventory management techniques to reduce costs, improve flexibility, reduce waste and have more time to focus on their customers. As firms look to reduce waste, increase turnover and be more flexible with their inventory, management professionals have attempted to identify how lean techniques can be adopted to build flexible and collaborative inventory. American Production Inventory Control (2019) shows that nearly 30% of companies in the developed countries are adopting lean principles to eliminate inventory waste.

Quality is an asset which may be offered to the potential consumer of a product or service (Adrienn, 2014). It is also the performance of the product as per the commitment made by the producer to the consumer. According to Lopes and Freitas (2015), there is one rule for industrialists and that is to make the best quality of goods possible at the lowest possible cost and as much as possible reduce waste. Thus it can be said that quality decision is based on various marketing considerations, production constraint, manpower constraint and waste processes management. In this way, the decisions concerning quality are not in the hands of one functional manager, since this involves overall strategic decision for running the business of a company. According to Heyman (2015), quality may be viewed in terms of products' fitness for consumers' use or consistence and conformance to the consumers' need. A more comprehensive definition of quality as adopted by International Standard Organization is "the totality of features and characteristics of product or service that bear on its ability to satisfy stated or implied need revolving around the customer".

2.1 Theoretical framework

This work is anchored on the theory of constraint. The theory of constraint developed by Eliyahu Goldratt in 1984 aims at identifying the most important limiting factor that stands in the way of achieving a goal and systematically improving that constraint until that limiting factor is removed. In this case, the limiting factor is the process and inventory

waste. In manufacturing activities, this constraint is called bottleneck. The theory of constraint takes a scientific approach to improvements. It hypothesizes that every complex system consists of multiple linked activities, one of which acts as a constraint upon the entire system. The theory provides a powerful set of tools to assist achieve that goal, methodology for identifying and eliminating constraints, the thinking process and through put. One of the appealing characteristics of this theory is that it inherently prioritizes improvement activities. The top priority is always the current constraint and this theory offers a highly focused support for creating rapid improvement. The core concept of the theory is that every process has a single constraint and that total process through put (a method of measuring performance and guiding management decision) can only be improved when the constraint is improved. A very important corollary to this is that spending time optimizing non-constraints will not improve significant benefits.

2.3 Empirical Review

Daferighe, James and Patience (2018) examine the influence of the practice of lean accounting on waste management in the Brewery Industry in Nigeria. A survey research design was adopted in this study. The source of data was primary data collected through a structured questionnaire administered to workers in Champion Breweries. The data collected were analysed with Chi-Square statistic. The result of the assumption tested revealed that the practice of lean accounting does not significantly influence waste management in Brewery Industry in Nigeria.

Okpala (2013) undertook an exploratory research to investigate the application of lean accounting as a strategy to achieve lean business philosophy in Nigeria manufacturing firms. The study population consisted of 53 manufacturing firms listed in the Nigeria stock exchange with 2,246 employees selected based on the researcher's criteria. 50% of the population used as sample frame were selected at random. The formulated hypotheses were confirmed and the result obtained revealed that lean accounting correlated positively with lean business philosophy but due to ignorance, implementation is insignificant in Nigeria.

Enaam and Ameer (2019) examined the impact of lean accounting on the financial performance of health care institutions. They analyzed the impact of value stream costing as a lean accounting tool in improving the financial performance indicators of healthcare institutions based on a study applied in a private hospital. A quantitative case study approach was carried out to assess the financial performance measures under the traditional costing system of the case hospital. The findings showed that implementing the value stream costing enables managers to distinguish between value-added activities and non-value added activities and consequently eliminating waste and saving the available resources for more effective use. The study also showed that the analysis of operations into value-added and non-value added activities allowed the managers to improve the competitive advantage by utilizing gains of value stream costing to set a lower price for their services.

Maskell & Baggaley (2006) examined lean management and the relationship between cluster firm level performance. The focus of this research was to develop and empirically test an instrument designed to evaluate the level of lean implementation in a company and relate it to the company's operational and financial performance. They identified

eight principles of lean and grouped them into 5 internally oriented lean principles including Just-in-Time (JIT) production methods, statistical process control tools, employee involvement, group technology and Total Quality Management (TQM). The study revealed that the lean cluster was highly associated with the implementation of JIT production methods, group technology and employees' involvement. It was least associated with two external components including supplier communication and customer involvement.

Chen & Cox (2012), using the framework of Womack et al. (1990) were the first to develop a list of principles which, in combination describe Lean. The authors identified nine lean principles and generated a list of 42 measurable determinants to indicate progress made in the effort of a company to become lean. The nine principles identified were: elimination of waste, continuous improvement, zero defects, JIT, pull system, multifunctional teams, decentralized responsibilities, integrated functions and vertical information systems. In their study, the principles indicated the ultimate goal of a lean company, while the determinants represent the changes made to the organization to achieve the desired performance.

Pattnaik & Reddy (2010), in their study created a model of 36 determinants called 'intermediate indicators', to assess changes made to manufacturing processes following lean principles and empirically tested a total of 41 companies in the automotive and industrial machinery industries. Their determinants were based on the following six lean principles: elimination of zero-value activities, continuous improvement, multifunctional teams, JIT production and delivery, integration of suppliers and flexible information system. In their framework, the authors measured the degree of use of each of the six principles and they found that sixty percent of the 36 principles were used by more than half of the respondents.

Heyman (2015) was the first to identify 22 determinants related to lean based on a scholarly review of literature, grouped them into four principles. The four categories included JIT, Total Quality Management (TQM), Total Product Management (TPM) and Human Resource Management (HRM). The survey instrument was sent out to 28,000 subscribers of Penton Media, Inc. publications specifically addressed to plant managers. The results of the research indicated that all four categories had a significant correlation to operational performance. Woehrle & Abou-Shady (2010) evaluated the level of awareness and implementation of lean principles and its determinants within the wood products and furniture manufacturing industry in Virginia. A mail survey was sent out to 1,193 companies and a total of 188 responses were recorded, resulting in a 16 percent response rate. Their results revealed that general determinants of lean, such as mission statement and employee cross-training are commonly implemented at the respondents' facilities.

Fullerton et al. (2013) were the first to extend the identification of lean determinants to the accounting area. The purpose of their study was to examine the role of Value Stream Costing (VSC) in a lean environment. The survey instrument was sent out to 476 U.S. companies who participated in Lean Accounting Summits organized between 2005 and 2008. A total of 244 responses were received for a 51.2 percent response rate from controllers and (Chief Financial Officers (CFOs) of the studied companies. The study revealed that top management support is positively correlated with the use of lean manufacturing practices, simplified accounting and value stream costing but is

negatively correlated with traditional accounting.

3.0 Methodology

This study adopted survey research design and data used for the study were collected using the researchers' constructed questionnaire. The population of this study comprised all the staff of Champion Breweries Plc, Uyo, Akwa Ibom State which is currently put at about three hundred (300). The researchers targeted only the senior and middle level management personnel of this company. This section was targeted because the researchers assumed that they could have more knowledge of lean accounting than the lower level staff. Hence purposive sampling technique was employed to select fifty staff members. The data collected were analyzed using tables, simple percentages, descriptive statistics, correlation analysis and the hypotheses were tested using ordinary least square regression technique.

3.1 Models specification

The models used in this study are presented below;

Model 1:

$$\text{Waste_Mgt} = B_0 + B_1(\text{Lean_Acc})_1 + \epsilon$$

Model 2:

$$\text{Inven_Mgt} = B_0 + B_1(\text{Lean_Acc})_1 + \epsilon$$

Model 3:

$$\text{Prod_Qua} = B_0 + B_1(\text{Lean_Acc})_1 + \epsilon$$

Where:

Waste_Mgt = Waste Management; Inven_Mgt = Inventory Management
 Prod_Qual = Product Quality; Lean_Acc = Lean Accounting
 B₀, B₁, B₂, B₃ = Regression Coefficients; ϵ = error term

4.0 Data Presentation, Analysis and Discussion

4.1 Data presentation and analysis

This section presents an analysis of the questionnaire administered and retrieved from the respondents, from which our recommendations and conclusions are drawn. A total of fifty copies of questionnaires were sent out to the respondents for data generation and only forty nine were duly filled and returned. Out of the thirty, four were male and fifteen were female.

Table 4.1
Alpha Test for Reliability, Consistency and Validation

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem covariance	alpha
Waste_Mgt	49	+	0.6974	0.3800	2.0419101	0.7857
Inven_Mgt	49	+	0.7184	0.3743	1.0388169	0.7823
Prod_Qua	49	-	0.6697	0.3050	6.0536001	0.6607
Lean_Acc	49	+	0.3509	0.0241	6.1234637	0.5759
Test scale					5.0644477	0.8689

Source: Authors' Compilation from STATA 16

The table 4.1 shows Cronbach Alpha test for reliability, consistency and validity of the study instrument which is the questionnaire. The minimum acceptable value for Cronbach's alpha is 0.70; Below this value the internal consistency of the common range is low. Meanwhile, the maximum expected value is 0.90; above this value is perceived as redundancy or duplication. Alpha value between 0.80 and 0.90 is usually preferred. In this study, the Cronbach Alpha test results as seen from the table shows a value of 0.87 which makes the instrument for this study reliable and valid.

Table 4.2
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Waste_Mgt	49	2.567347	.5976997	1.6	4
Inven_Mgt	49	3.253061	.6490705	2	4.4
Prod_Qua	49	3.293878	.6404452	2.2	4.4
Lean_Acc	49	3.19449	.4869637	2	4.17

Source: Authors' Compilation from STATA 16

Table 4.2 shows the descriptive statistics of the study. From the table, it is observed that on the average, waste management is 2.58 with a standard deviation of 0.60 and a minimum and maximum value of 1.6 and 4 respectively. Similarly, on the average, inventory waste management is observed to be 3.25 with a standard deviation of 0.65, on the minimum, inventory waste management is 2 on the maximum 4.4. Product quality is observed to be 3.29 on the average which means that there was 33% improvement in product quality with lean accounting in place. Finally, lean accounting is 3.19 on the average with a standard deviation of 0.49 and a minimum and maximum value of 2 and 4.17.

Table 4.3
Shapiro Wilk Test for Data Normality

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
Waste_Mgt	49	0.97206	1.293	0.548	0.29201
Inven_Mgt	49	0.92342	3.545	2.696	0.00351
Prod_Qua	49	0.96497	1.621	1.029	0.15168
Lean_Acc	49	0.98574	0.660	-0.885	0.81201

From the results obtained in table 4.3, it is observed that only the dependent variable of inventory waste management (Prob > z = 0.00351) violates the normality assumption. However, the p-values of the ordinary least square regression technique are relied upon for interpretation since the variables are not normally distributed. All other variables in this study follow a normal distribution.

Table 4.4 Spearman Rank Correlation

Key				
	rho			
	Number of obs			
	Sig. level			
	Waste_wt	Inven_wt	Prod_Qua	Lean_Acc
Waste_Mgt	1.0000 49			
Inven_Mgt	0.3518 49 0.0132	1.0000 49		
Prod_Qua	-0.2575 49 0.0740	-0.2980 49 0.0376	1.0000 49	
Lean_Acc	0.1169 49 0.4238	-0.1578 49 0.2788	0.0745 49 0.6109	1.0000 49

Source: Authors' Compilation from STATA 16

Specifically, the analysis from the spearman rank correlation shows that lean accounting is positively correlated with process waste management (0.1169) and product quality (0.0745), but negatively correlated with inventory waste management (-0.1578). However, the associations are seen to be weak hence there is no room to suspect the presence of multicollinearity in the estimated models.

Table 4.5
Simple Regression Estimation Result
Models

Variables	Process Management	Waste	Inventory waste Management	Product Quality
Lean Accounting				
Coefficient	0.1925		-0.1615	-0.0377
t_Statistics	(2.09)		(-0.84)	(-4.20)
Probability_t	{0.032}**		{0.470}	{0.000}*
	F(1, 47) = 1.19	=	F(1, 47) = 0.70	= F(1, 47) = 0.04
	Prob > F = 0.0028	=	Prob > F = 0.0040	= Prob > F = 0.0084
	R-squared = 0.2246	=	R-squared = 0.2147	= R-squared = 0.2008

Note: t-statistics and respective probabilities are represented in () and { }
Where: ** represents 5% & * represent 1% level of significance
Source: Authors' Compilation from STATA 16

Table 4.5 presents results for least square regression and the model's goodness of fit as captured by the F-statistics and the corresponding probability value. From this table, it is observed that the probability value of the F-statistics for the three models shows a 5% statistically significant level suggesting that the entire model is fit and can be employed for interpretation and policy recommendation.

4.3 Discussion of findings

The regression results of process waste management model presented in table 4.5 reveal the result of the variable of lean accounting as follows: (Coef. = 0.1925, t = 2.09 and P -value = 0.032). Following this results, it is revealed that lean accounting significantly affects process waste management of Champion Breweries Plc. This implies that the adoption of lean accounting system will improve process waste management. This outcome contradicts the findings of Daferighe, James and Patience (2018) who found that lean accounting does not significantly affect process waste management. In the same vein, the finding is also inconsistent with the position of Pattnik and Reddy, 2009 who found that lean accounting has a negative effect on waste management.

The regression results of inventory management model presented in table 4.5 reveal the result of the variable of lean accounting as follows: (Coef. = -0.1615, t = -0.84 and P -value = 0.407). Following these results, it is revealed that the effect of lean accounting on inventory waste management is negative and statistically insignificant at 5% or 1%. This finding is consistent with the stated null hypothesis which leads to its acceptance. Thus, lean accounting does not have any significant effect on inventory waste management of Champion Breweries Plc. This is in line with the findings of Unah and Unweni (2017). However, the result negates the findings of Enaam & Ameer (2019) and Chen & Cox (2011) who noted that keeping control of inventory is important to lean accounting.

The regression results of product quality model presented in table 4.5 reveal the results of the variable of lean accounting as follows: (Coef. = -0.0377, t = -4.20 and P -value = 0.000). Following these results, it is revealed that the effect of lean accounting on product quality is negative and statistically significant at 1% for Champion Breweries. This implies that lean accounting system does not improve product quality of Champion Breweries. This is contrary to prior studies of Lopes and Freitas (2015) who observe that consumers use trade-off values between lean involvement and product quality. However, this finding is in line with Heymans (2015) who notes that quality-oriented customer service is not directly linked to lean accounting but to client retention policy of the firm.

5.0 Conclusion

Lean accounting has been a recent development adopted by companies to focus on customers' values rather than shareholders' value which before now was the main objective of any firm. A lean organization understands customers' value and focuses its

key processes to continuously improve this value. On the whole, this study found that lean accounting has significant effect on process waste management, significant but negative effect on product quality and insignificant effect on inventory waste management of Champion Breweries Plc. Finally, the study recommends that companies should fully adopt lean manufacturing processes and lean accounting methodologies in order to enjoy the attendant benefits of waste reduction, product quality and customer retention, which ultimately maximizes shareholders' wealth.

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