Value Engineering and Profitability of Public Limited Companies in Nigeria

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Abstract

In view to reduce cost and increase profitability, without sacrificing the value derived, this study empirically examines the impact of value engineering on profitability of selected public limited manufacturing firms in Rivers state. Profitability can be attained by increasing per unit revenue, decreasing unit cost or a mix of both. So there is a need for value engineering as a management tool, which aims at providing an improved product design that will not reduce the value derived by the customers. This means that Value engineering as a technique involves the identification of new alternatives to product design at a reduced cost. The research design utilized was quasi-experimental research design (survey). The sampling method used was the purposive sampling technique. Spearman's rank correlation coefficient, simple regressions was used to test the postulated hypothesis at 0.05 level of significance computed within the SPSS software. The study reveals that there is significant impact of product design on earnings per share. Based on the findings, the following recommendation were raised: that Manufacturing companies should endeavour to identifying improved product designs that reduces the product's cost without sacrificing functionality so as to be profitable and finally, Value engineering should be inculcate in the organization culture of companies so as enable them effectively put value engineering job plan into use for improved profitability without sacrificing the value to be derived by the customers.

Keywords: Value Engineering, profitability, product design, function analyses and Value

1.   Introduction

As organization seeks to maximize profitability, they have utilized various business strategies and techniques to ensure that this objective is realized. With the current competitive and fast pace dynamic environment, every organization strive to maintain it customers based, and also gain competitive advantage over its competitors by providing goods that are of value to the customers. Value according to Miles (1989) is the lowest possible price that can be paid for to provide a reliable function or services.

Over the world, there is always a need to provide goods that are of values and also capture the attention of the customers, and Nigeria is not an exception. Organization can do this by revisiting the product designs of products offered to the market. So there is a need for value engineering as a management tool that aims at providing an improved product design that will not reduce the value derived by the customers.

According to West Virginia division of highway (2004), "Value engineering is the systematic application of recognized technique by multi- discipline team that identifies the function of a product or service, establishes a worth for that function; generates alternative through the use of creative thinking, and provides the needed functions, reliability at the lowest overall cost." This approach requires that in the process of minimizing cost, the required quality and performance should not be sacrifice. Value engineering as a technique involves the identification of new alternatives to product design at a reduced cost.

So organizational profitability has become the concern of researcher as there are quite a number of study on value engineering, but not much work has be done empirically on this topic in this part of the globe. So this study aims at empirically ascertain value engineering impact on public limited companies profitability in Nigeria.

1.1 Statement of the Problem

Since organization needs to present products that are of value to the customer for them to be profitable, every organization is in a need to achieve this. But the problem here is that not all organization has what it takes to provide the necessary product design that will culminate to value to the organization.

Lack of innovation product design which is part of value engineering is lacking in organization. Also inability to identify alternative to indentified function of a product is a problem faced by most organization in their production process. If there is no alternative to identified function, it will be difficult to reduced cost without sacrificing the value to be derived by the customers. Therefore cost reducing is an essential criterion of public limited companies in Nigeria for been profitable and Value Engineering remains a technique for achieving this goal of cost reduction and profitability in public limited companies.

1.1.1 The Purpose of the Study

The primary purpose of the study is to empirically investigate the impact of value engineering on profitability of public limited companies in Nigeria. While the specific objective is:

1.   To ascertain the impact of product design on Earning per share (EPS).

The hypothesis was formulated as follows:

HO₁ There is no significant impact of product design on Earning per share (EPS).

1.1.2 Review of Related Literature

This study makes used of the theories of the firm which are in two categories namely "Targeted and Encompassing theories of the firm."

Targeted Theories

Under the targeted theory, the single purpose of the organization is to maximize profit. They include

Profit Maximization: under this theory, the organization is considered and viewed as a profit making machine that has as its characteristic the efficient utilization of the organizational resources in order to be profitable. Cyert and March(1963) asserted that "A key assumption is that the decision makers have access to perfect information and so fails to fully appreciate the different risks of alternative investment opportunities"

Market Value: This theory takes notice of the risks involved in an investment and the best possible decision to be taken to maximize the prevailing market value of securities of the organization. Seth and Thomas (1994) opined that "A key weakness of this theory is it fails to accommodate the cost of managers."

Encompassing Theories

The Encompassing theory goes beyond the targeted theories. It sees the wider view of the organization in respect to profit maximization. They include

Behavioural: According to Cyert and March (1963), this theory sees organization in terms of its behaviour towards gaining satisfactory profit rather than just maximizing profit in large organizations, things get done through stakeholder conflict and bargaining which result to providing solution to problem.

Resource Dependency: The essence of organizations existence is to accomplish outstanding results through the use of its resources under the manager's custody. According to Pfeffer and Salancik (1978), "organizations survive by maintaining support and obtaining resources from the external coalitions."

Life Cycle: Under the life cycle theory, the firm is view to be involved in process/stages of development. Carbone, (1996) and Romani(1997)asserted that "Value Engineering as a cost reduction technique that has proven to be effective in the developed world in countries like U.S.A, Japan and Western Europe but with little or no application in developing countries especially in Africa". Palmer et al, (1996) opines that "The search for alternative components therefore became imperative but these alternatives were equally unavailable. With this challenge, the search turned not to alternative components but rather to alternative methods of fulfilling the tasks of the components," The procedure involves in ascertaining alternative methods for carrying out a given functions is known as "function analysis." which has now been developed to as Value Engineering.

Drury (2000) asserted that "The aim of Value Engineering is also to achieve an assigned target product cost by (i) identifying improved product designs that reduce the product's cost without sacrificing functionality and/or (ii) eliminating unnecessary functions that increase the product's costs and for which customers are not prepared to pay extra for." According to Sivaloganathan et al (2000), "Value Engineering is a form of cost /benefit analysis where functions are viewed as the beneficial characteristics of the product." Value Engineering technique is centered on value concept and it show whether a cost is worth incurring or not.

CONCEPTUAL FRAMEWORK
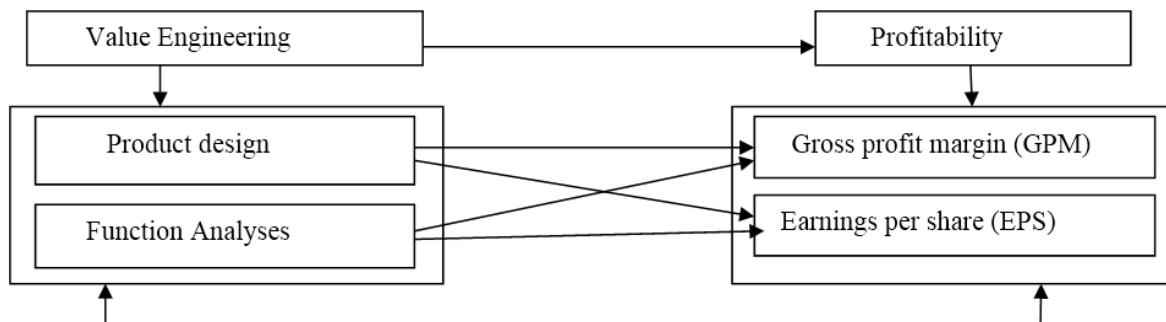
The framework above shows the variables involved in this study, which are: value engineering as the predictor variable, profitability as the criterion variable, the proxies for the predictor variable (value engineering) are product design, and function analyses while that of the criterion variable (profitability) are Gross profit margin (GPM) and Earnings per share (EPS).

1.1.3 Concept of Value Engineering

Value engineering as a concept is a technique that involves the identification of new alternatives to product design at a reduced cost. It is define "as the systematic application of recognized techniques which identify the function of the product or service, establish a monitory value for that function and provide the necessary function reliability at the lowest overall cost," (Chougule and Kallurkar, 2012).

"Value Engineering is a tool whose strength lies in the ability to clearly delineate design alternatives and to suggest choices based on the necessity or desirability of the function, the economic availability achieving that function, and the cost-worth relationships that assures growth and prosperity."(UDOT, 1993). Abdulaziz (2010) opined that "Value Engineering is a management technique for cost control."

Finally, West Virginia division of highway (2004), assert that "Value engineering is the systematic application of recognized technique by multi- discipline team that identifies the function of a product or service, establishes a worth for that function; generates alternative through the use of creative thinking, and provides the needed functions, reliability at the lowest overall cost." This approach requires that in the process of minimizing cost, the required quality and performance should not be sacrifice.

1.1.4 Concept of Product Design

Value Engineering has lead to extensive studies on product design adopted in the manufacturing industry (Sharma et al., 2006). The application of Value Engineering is best suitable at the beginning stage of a product development cycle because it gives the much needed direction on how improvement can be achieved. VE Study is applied during the design planning stage to define project functions, goals, objectives, requirements, design Criteria and Scope Of Work (SOW). According to Chirag (2010) "A product design should incorporate characteristics such as its appearance, the material it is made of, its dimensions and tolerance and performance standard". He further opined that the external factors for product design should include; customers requirement, quality, reduction of manufacturing costs and controls, the assembly and distribution process, environmental effect before and after manufacturing and safety and hygiene factor.

1.1.5 Concept of Function Analyses

The concept of function analyses is the procedure involves in ascertaining alternative methods for carrying out a given functions, this was later developed to as Value Engineering. Functional analysis has similarities to value engineering in that it is applied during the development stage of a new product, but it uses the functions of a product (or service) as the basis for cost management. According to CIMA as stated in Norwood (2013), "Functional analysis is an analysis of the relationship between product functions, their perceived value to the customer and their cost provision". Norwood (2013) opined that "Functional analysis is concerned with improving profits by attempting to reduce costs and/or by improving products by adding new features in a cost effective way that are so attractive to customers that profits actually increase". The completion of a functional analysis exercise will result in a cost-effective design and will ultimately result in an improved competitive advantage.

1.1.6 Concept and measures of Profitability

Profitability is viewed by Husnan (2001) as the ability of the firm to raise profit from sales, asset, and certain capital stock." Profitability is one of most frequently used financial performance indicator in organization. Profitability ratio in one form or another, are intended to measure how efficiently the firm manages its operations. Gross profit margin (GPM), Earnings per share (EPS) and Book value per share (BVPS) are the profitability measures used in this study.

Earnings per share (EPS)

Earnings per share show shows how much money is accruing to the shareholder from the companies operation, therefore a growth in earning per share is a good indicator of improved management performance. It is express below with the formula as:

$$\frac{(\text{Net Profit after Taxes} - \text{Preference Dividends})}{\text{Number of Equity Shares}}$$

Chatfield, Dalbor, and Willie (2005) assert that "shareholder value for the company is strongly influenced by analysis estimates of the company's future earnings per share (EPS)."

1.1.7 Empirical Review

An empirical review of related literature in manufacturing sector on the subject matter showed that most studies focus on the product, process design and product improvement. According to study carried out by Chougule and Kallurkar (2012), on selected components of Universal Testing Machine "observed that the unnecessary increase in cost is due to use of expensive material, complicated design, increased in variety of hardware items and thereby increasing the inventory. Therefore, Value Engineering is executed by implementing design modifications and change in materials of components. Value Engineering results in use of alternative less expensive and light material. VE is also applied as a tool for cost design (Nishimura, 2007), cost reduction and profit improvement (Yoshikawa et al., 1994). VE has lead to extensive studies on product design adopted in the manufacturing industry (Sharma et al., 2006). This includes the adoption of VE as part of the integrated system in achieving optimization in product design. "VE was integrated with Quality Function Deployment (QFD) and Failure Modes and Effects Analysis (FMEA) as a structured and targeted approach towards achieving quality, cost and reliability deployment objectives"(Chin et al., 2006). The results aid in better product design, quality and the ability of the development team to handle any conflicts that arise out of meeting customers' needs and any inherent fuzziness in the system. This meets the needs of the customers and organization, besides providing

customers with what they perceived as important (Prasad, 1998). "VE was also integrated with Technical Importance Ratings (TIRs), Customer Importance Ratings (CIRs) and value graphs. Product designers are able to prioritize the solutions for product improvement that actually meet the needs of the entire value chain, which includes customers, the company and suppliers"(Prasad, 1998).   There are also studies that examined VE application in respect to management cost techniques in manufacturing organizations (Afonso et al., 2006; Yoshikawa et al., 1995). Ibusuki and Kaminiski (2007) identified several factors for VE's successful integration; they are: "strategic cost planning, development of multifunctional teams, important function of finance, integration of cost planning with the company's global strategy, and the use of tools and techniques that support VE." Greenfield **(2004)** "describes a process for applying the value methodology to develop a new design concept rather than the traditional use of VE to optimize an existing design. VE techniques are iteratively inserted into the planning process to select a concept that delivers the optimum life-cycle cost." Eneichiet (2014) in his study on value engineering and profit performance in manufacturing firms concluded that there is a significant relationship between profitability and cost reduction. He further stated that Value Engineering is a parallel and necessary process for good conceptual design.

1.1.8 Research Methodology

The research design adopted for this study is the cross-sectional research design which is part of the quasi-experimental research design. The population of the study is made up of three hundred and sixty five (365) public limited companies in Nigeria as listed in the Nigeria stock exchange, 2015 while the accessible population quoted manufacturing companies operating in Port Harcourt.

The data for this study was source through the primary and secondary sources. The primary source of data was gathered through structured research questionnaire while the secondary data collection was relevantly sourced through the financial statement of the selected companies obtained from the Nigeria stock exchange (NSE) over a period of 5year (2010-2014).

The statistical tool used is Spearman's Rank Order correlation coefficient and multiple regression computed within the SPSS software.

Validity of Instrument

Validity of the instrument employed for this study was achieved through peer vetting, supervisors approval and acceptance by knowledgeable professionals on the subject.

Reliability of Instrument

The reliability of our instrument is measured by cronbach Alpha, generated through SPSS analysis. Also the financial statement of the companies under study is highly reliable because they give consistent information and results. The reliability table above shows a Cronbach's Alpha reliability coefficient of 0.945 which indicates a very high level of internal consistency for our scale.

Model Specification

Following the review of related literature by various scholars and authors on the subject matter value engineering and profitability, the researcher deem it necessary to express the relationship that exist between these variables in a Mathematical model.

$Y = a + b_1x_1 + b_2x_2 + \ldots b_xx_k$

Where

Y=dependent variable (profitability)

x_1=Product Design

x_2 = Function analyses

a=constant term of the model

b=coefficient of the model

1.1.9 Empirical Result

HO$_1$ There is no significant impact of product design on earnings per share (EPS).

Correlations

		Product design	Earnings per share (EPS).
Spearman's rho	Product design	"Correlation Coefficient	1.000	.889**
		Sig. (2tailed)"	.	.001
		N	50	50
	Earnings per share (EPS).	"Correlation Coefficient	.889**	1.000
		Sig. (2-tailed)	.001	.
		N"	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Source: S PSS Version 21

The table above shows a correlation coefficient of 0.889 which indicates a strong positive correlation between product design and Earnings per share (EPS), and a p-value of 0.005 which is also far less than the

conventional "0.01 and 0.05 levels of significance."

Decision

The null hypothesis was rejected which means that there is a significant correlation between product design and Earnings per share (EPS).

1.1.10 Results and Discussion

Hypothesis One (HO$_1$) sought to examine the impact of product design on earnings per share. To test this hypothesis, it was hypothesized that there is no significant impact of product design on earnings per share (EPS). This shows a correlation coefficient of 0.889 which indicates a strong positive correlation between product design and Earnings per share (EPS), and a p-value of 0.005 which is also far less than the "conventional 0.01 and 0.05 levels of significance." To this, the null hypothesis was rejected which means that there is a significant correlation between product design and Earnings per share (EPS). This is in line with Schutte (2005) assertion that "Feelings and impressions of a product are important for the decision of purchasing it or not. Designing attractive products therefore requires knowledge about the feelings and impressions the products evoke on the customer and the user." Integrating such affective values in product design requires the introduction of suitable methods into companies' product design processes, methods which can capture and convert subjective and even unconscious feelings about a product into concrete design parameters." This finding may be accounted for by the fact the respondent may be of the opinion that if the feeling and impression of customers and users are incorporated in the product design it will increase the organization market value thereby enhancing it earnings per share.

1.1.11 Conclusion and recommendation

From the study so far carried out, it is clear that Vale Engineering enables the management of the team's thinking so that the best use of the knowledge and experience they have can generate new ideas to perform functions and propose alternatives." This alternative function comes in the form of improved product design so as to improve profitability without sacrificing the value to be derived by the customers. Resulting from the findings of this study, we hereby conclude that there is a significant impact of product design on earnings per share. That is product design impact positively on the profitability of a manufacturing organization. Therefore Value engineering is a management tool of cost control that aims to reduce cost and increase profitability without forfeiting the value to be derived by the customers.

Based on the findings and conclusion, the following recommendation were made

1.   Manufacturing companies should endeavour to identifying improved product designs that reduces the product's cost without sacrificing functionality so as to be profitable

2.   Value engineering should be inculcate in the organization culture of companies so as enable them effectively put value engineering job plan into use for improved profitability without sacrificing the value to be derived by the customers.

1.1.12 CONTRIBUTION TO KNOWLEDGE

The empirical findings of this study will contribute to knowledge on the topic area and reduce the dearth of empirical finding on the topic area in this part of the globe Nigeria.

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APPENDIX
RELIABILITY TEST

"Reliability Statistics"

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.945	.945	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Product Design	8.02	6.877	.808	.717	.978
Function Analyses	7.70	6.827	.899	.925	.910