

Reduction of Production Cost in Nigeria Manufacturing Industry Using Value Engineering Technique

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Abstract:-This study is aimed at investigating the effect of Value Engineering technique on production cost reduction in manufacturing industry in Nigeria. The case study research design was employed for this study, simple cost benefit analysis was employed to analyze the data collected also the calculated cost performance index (CPI) show the cost sheet for march 2018 was actually over budgeted by 0.6% which implies that, as Notore chemical industries increase their value engineering activities production cost will be reduced by 0.6% as well as increasing their productivity. Based on the findings, it was recommended that an in-depth application of Value Engineering technique on product cost reduction in the manufacturing industry needs to be encouraged. It also proposes the technique for adoption as a standard practice for production cost reduction in the manufacturing industry in a developing country like Nigeria. Lastly it should be encouraged within the Nigeria manufacturing firm to harness the best possible mean of managing resources for production. The use of value engineering within the Nigeria manufacturing companies will also guarantee quality products at affordable cost.

Keywords: value engineering, production cost reduction, manufacturing industry and cost benefit analysis.

I. INTRODUCTION

In a free industrial settings involving high level of competition the likely hood of becoming more successful in business over the long period depends on consistently providing customers with the best value for the price asked for on a particular product or service, Competition therefore determines what direction companies will have to take in setting and enhancing the value content of a product, to achieve competitive edge over their product and services. For manufacturing and service industry, there is need for them to engage in cost reduction approach of delivering their service or product at the least cost to be able to survive in a competitive market therefore cost reduction technique is an essential competitive strategy for manufacturing companies in Nigeria to gain competitive advantage. The Nigeria consumers are price sensitive and would not want to pay extra for any product or services because of the poverty level of the country. This fact as reported by the United Nations World

fact book (2005) shows that majority (at least 66%) of the country population live under extreme poverty line.

Cost reduction approach like Value Engineering needs to be facilitated or encouraged within the manufacturing industry to achieve the best possible mean of managing resources for production to also guarantee quality products at lower cost, not what the company think is best or reasonable but what the customers can be able to afford for such products. A competitor brings in a product at a lower cost or same cost with better features and then it becomes essential to re-look and work on your product so as to remain competitive in the market.

II. WHAT IS VALUE ENGINEERING?

It is an effective technique and approach which has been in existence since World War II. Value Engineering is a strategic and multi-disciplined team approach which is targeted at analysing those functions of a product, service or processes at the design stage to accomplish only the functions that are essential.

This Technique guarantees that the required performance and quality are maintained while reducing cost of the design, at the same time improving the overall value of the product Performance, reliability, quality, durability, and effectiveness of the product or service. Value Engineering unveils new less cost methods and alternatives to the design of products and services. To that regard, while attempting to cut down the manufacturing cost of some products.

III. VALUE ENGINEERING METHODOLOGY/APPROACH

The Value Engineering job plan is an organised plan of action that achieves every aspect of value engineering studies (West Virginia Department of transportation, 2004). It is like a vehicle that conveys the project from start to finish by adhering to some procedures; the Value Engineering job plan make sure that preference is given to all the important aspect of the problem, Though the job plan breaks down the study into a different set of work elements in most cases judgment is necessary to ascertain the level at which each phase is

performed considering the availability of resource and the results expected.

The Value Engineering job plan breaks down the task being studied into different phase to ensures a smooth flow of the entire study

A. Information Phase: In this phase the team is briefed with the present state of the Project and all team members participating in the value engineering project as a whole to determine the necessity of the project and Areas of high cost as well as low worth are identified. Also all data needed for Value Engineering study are collected.

B. Functional Phase: This stage is the most crucial aspect of the value engineering study as it is term the soul of value engineering stated by Oludimu O. Ehalaiye, (2008).The functional phase starts with the comprehensive study of the various components of the product to ascertain the function performed in the product. This will enable the classification of the functions being performed by the components as primary or secondary function (Ho et al., 2000, Sivaloganathan et al, 2000). The functional Analysis is targeted at eliminating unnecessary functions that are irrelevant and provide alternatives that are cheaper to perform the same function.

C. Creative phase: at this phase the team is task to come up with creative ideals. The technique that is commonly used for this type of analysis is brainstorming. As stated by (Sperling, 2001). This session is known to be the “brainstorming” session; this stage is concerned with developing alternative way of achieving the basic function with lower cost.

D. Evaluation Phase: on this stage the team tries to compare the ideas gotten from the creative phase. The evaluation phase is achieved by listing the ideas in a tabular form in order of importance, Ideas that are least important are therefore discarded those ideas that shows potential of cutting cost and performance improvements are adopted. In most case a weighted evaluation is introduce to be accountable for positive impacts rather than cost and both capital and life cycle.

E. Development/Recommendation Phase: In this phase final recommendations are developed from the alternatives that were adopted in the analysis phase, economic and detailed technical testing are carried out, also the probability of successful implementation is assessed. As stated by Hauser, (1997).The aim of this phase is to transform the ideas that show great potential into actual examples.

F. Presentation Phase: The presentation phase requires presenting the best selected alternatives. Those that have the capacity to implement the proposed solutions that is acceptable. Also a formal value engineering proposal (VEP) is prepared, that contains the information needed in order to take decision to implement the proposal.

G. Implementation and Follow-Up phase: In the implementation phase which is also known as follow-up phase at this stage management insure that the approved recommendations are converted into actions. Most times management needs an extra push to implement processes like this especially when they consider the cost of implementation, the management tends to kick against it, it is now left for the Value Engineering to come up with better recommendations

H. Audit Phase: This phase requires the necessary review and examination of results and activities to assess the adequacy of the system or ascertain the effectiveness of the system. And there are four audit process usually conducted,

- Technical Audit.
- Cost Audit.
- Standardization Audit.
- Environment Audit.

IV. LITERATURE REVIEW

Value engineering technique has been in use in the world for 70 years and in India for nearly about four decades now as many companies are practicing and competing to contain their costs.

Over time the results of Government policies has affected the business environment in the country which has brought about remarkable change. All sectors of industry including the service and hospitality sector are growing quickly With the coming up of several new industries in the public and private sectors using the latest technology and also in the considerable reduction of the import duties, customer today has a substantially more extensive market to decide what to settle for, for this reason our customers are increasingly more demanding and they expect that our product and services should not only match their stringent specifications, but also readily made available at a comparable and affordable cost.

Value Engineering has contributed enormously to ensure our operational costs are minimal and product cost at a competitive price, I am certain that through its unique technique of Functional approach it will enable us to effectively address new difficulties.

The sustainable and inclusive growth of any organization is possible by improving the various parameters like Productivity, quality, cost and delivery. It is imperative to mention that this improvement needs excellent team work at every function within employees having innovative knowledge and skill. Value Engineering is one such proven technique, applied for last few decades in many organizations resulting in excellent sustainable and inclusive growth. The front runner industries of India have implemented Value Engineering successfully for several years and have achieved excellent sustainable and inclusive growth. (AlokGhosal, 2017).

Miles (1989) allege that value engineering will be “a complete system if factors that cause unnecessary cost on products, process, or services can be identifying and dealt with. This system requires innovation, knowledge and skills to effectively fish out efforts and costs that are not necessary to the customer’s needs in a product.

Drury (2000) also alleged that “The purpose of Value Engineering is to accomplish a designated target product cost by (i) seek for methods or ways that’s identifies improved product designs that will also bring down the product cost without affecting product performance and features or (ii)

ruling out functions that are not necessary which buildup additional cost on product, which customers may see as superfluous and are not willing to pay extra for.

V. METHODOLOGY

A case study research was adopted for this work and secondary data was collected been , notore chemical industries production cost data sheet for march 2018 it was further analyse using simple cost benefit analysis also it was subjecting to cost performance index (CPI).

Table I: Production Costing on Urea Plant

S/N	Items For Urea Production	Design Specific Consumption %	Actual Specific Consumption %	Budgeted	Actual	Unit Cost(₦/Unit)	Total Cost(₦)
1	Ammonia(MT)	0.61	0.55	15,860	9,398	60,000.00	563,854,800.00
2	UF-85(MT)	0.0064	0.0046	166	78	239,269.43	18,679,764.54
3	Steam (MT)	1.7	1.52	44,200	25,913	1,201.86	31,143,637.57
4	Power (KWH)	24	48	624,000	819,330	500,714.50	14,861,206.36
5	Catalyst						
6	Raw Water To UCT(MT)	2.19	14.15	56,940	240,760	7.60	1,829,776
7	Urea Cooling Water Chemicals (Spr) (₦)						569,633.06

- Grand Total for Actual Cost = ₦630, 938,818.29
- Grand Total for Budgeted Cost = ₦1, 056,761,581.2

VI. DATA ANALYSIS

From table 4.3 the net savings after modified cost and the percentage in reduction of cost was calculated using cost benefit analysis also cost performance index was established as seen below.

Table 4.3 show a reduction in cost of materials use for urea production from budgeted to actual after some modifications where done particularly at the procurement department, where they are seeking for a cheaper way of sourcing for production materials also putting quality in to consideration which is one of the intentions of value engineering, Which seeks alternative way of achieving a specific function at reduced cost.

1. cost benefit analysis on table 4.3

$$CPI = \frac{1056761581.2}{630938818.29} = 0.6\%$$

- Net saving for Ammonia
 Budgeted cost – modified cost = 951,600,000 – 563,854,800 = 387,745,200

$$\text{Percentage savings on cost} = \frac{387,745,200}{951,600,000} \times 100 = 40.75\%$$

- Net savings for UF-85

$$\text{Budgeted cost – modified cost} = 39,718,725.38 - 18,679,764.54 = 21,038,960.84$$

$$\text{Percentage savings on cost} = \frac{21,038,960.84}{39,718,725.38} \times 100 = 52.97\%$$

- Net savings for steam

$$\text{Budgeted cost – modified} = 53,121,770 – 31,143,637.57 = 21,978,132.43$$

$$\text{Percentage savings on cost} = \frac{21,978,132.43}{53,121,770} \times 100 = 41.37\%$$

- Net savings for raw water to UCT (MT)

$$\text{Budgeted cost – modified cost} = 432,744 – 1,829,776 = -1,397,032$$

$$\text{Percentage savings on cost} = \frac{-1,397,032}{432,744} \times 100 = -0.32\%$$

Table II: Net Savings on Cost

S/N	Name Of Materials	Budgeted Cost In ₦	Modified Cost In ₦	Net Saving In ₦	% Cost Reduction
1	Ammonia (MT)	951,600,000	563,854,800	387,745,200	40.75
2	Uf-85 (MT)	39,718,725.38	18,679,764.54	21,038,960.84	52.97
3	Steam (MT)	53,121,770	31,143,637.57	21,978,132.43	41.37
4	Raw Water To UCT (MT)	432,744	1,829,776	(1,397,032)	(0.32)
	TOTAL	1,044,873,239.4	615,507,978.11	429,365,261.27	134.77

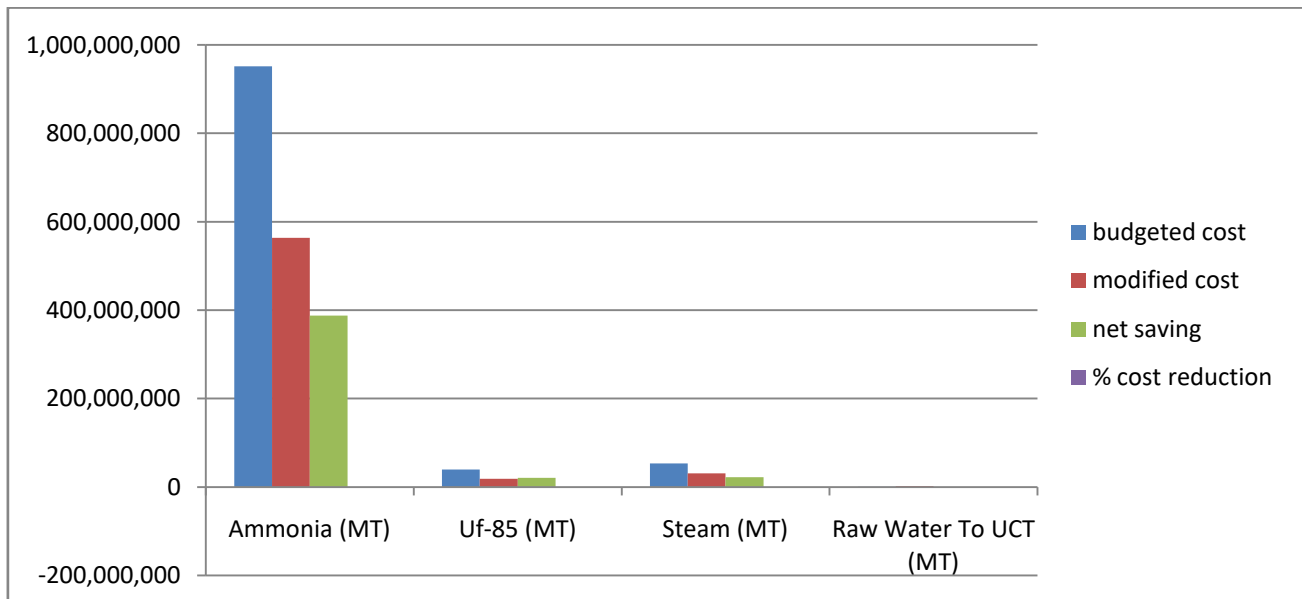


Fig. 1 Graphical representation of Net savings on cost.

VII. CONCLUSION

Table 4.3 shows a reduction in cost of materials use for urea production from budgeted to actual after some modifications where done particularly at the procurement department, where they are seeking for a cheaper way of sourcing for production materials also putting quality in to consideration which is one of the intentions of value engineering, Which seeks alternative way of achieving a specific function at reduced cost without giving up quality.

Also the Cost performance index (CPI) indicates that the urea plant production cost is over budgeted by 0.6% when compared with both actual and budgeted cost this shows that an increase in value engineering activities by the company can further reduce its production cost by 0.6%.

VIII. RECOMMENDATION

There is need for proper awareness on the technique and benefits of value engineering to all stakeholders within Notore chemical Industries and the Nigeria manufacturing Industry at large in order to bridge the gap Between learning and practical of the Technique.

I strongly recommend that Value Engineering needs to be encouraged within Notore chemical industries and the Nigeria manufacturing firm to harness the best possible mean of managing resources for production also guarantee quality products at affordable cost. There is need for more value Engineering training, workshops and seminars in order to enlighten the potential participants in Notore chemical industries and the Nigerian manufacturing industry on the principles, concept and techniques involved in the value engineering process.

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