COST-TO-WORTH VALUE ENGINEERING ANALYSIS OF MANUFACTURING INDUSTRIES IN AKURE SOUTH LGA, NIGERIA

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Abstract: The production operations in our industries today have some of their components contributing to the cost instead of making additional contribution to value. The areas of labour, inventory, material purchase, maintenance, energy and quality in Nigerian manufacturing industries were investigated. The result of the investigation shows that the area of labour shows a very good savings, while energy has the highest values, followed by inventory and maintenance. Material purchase and quality are a little bit above normal worth. As the savings in labour gives the companies' advantages, it adversely affects the labours that are paid far less than their normal worth. Suggestions were made for the companies to make additional savings.

Keywords: Cost-to worth. Value Engineering. Manufacturing industries.

1. INTRODUCTION

People are interested in saving money. Everyone is looking for a sound investment with a high rate of return for their investment money. An important factor is that all design products have unnecessary cost regardless of how excellent the design team may be [1].

The benefit of spreading our investment money, providing more for less money, increasing efficiency and cutting down our dependence of high energy cost and plant facilities needs to be recognised today and also in the future. Therefore, this research makes use of value engineering analysis which a proven management technique is using a systemized approach to seek out the best functional balance between the cost, reliability and the performance of a product or project. The research seeks to improve the management capability of people and to promote progressive change by identifying and removing unnecessary cost.

2. LITERATURE REVIEW

[1], [2] and [3] defined value engineering as a system for identifying and dealing with the factors that cause uncontributing cost or effort in products, processes or services, the system uses all existing technologies, knowledge, and skills to identify costs or efforts that do not contribute to the customers need and wants. Value programs have been described at different times as value analysis, value engineering and value management. [1] differentiate between the different types of value of programs available thus:

Value Engineering: describes a value study on a project or product that is being developed. It analyses the cost of the project as it is being designed.

Value Analysis: describes a value study of a project or product that is already built or designed and analyzes the project to see if it can be improved.

Value Management: Identified the methodology and techniques used in value work, but do not distinguish between engineering of a building or facility and the analysis of a product. It is used to describe the centre field of value endeavours. Value engineering is system oriented; multidiscipline team approach: life cycle oriented; a proven management technique, and not a design review, a cheapening process, a requirement done on all designs, and quality control. The history of value engineering was traced to General Electric company, USA and Lawrence Miles, who is called the father of value Engineering. Lawrence Miles looked at value engineering/value analysis as an organised, creative approach, which has for its purpose the effective identification of unnecessary cost, i.e. the cost which provides neither quality, nor use, nor life, nor appearance, nor customers features.

General Electric Company, USA who are the first to introduce the value engineering concept claimed to have made a savings of some US $200 million in the first seventeen years

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through its application. It was also widely used by the department of defence in USA, which made a savings of US $14 million in the first five years of the programme. With such colossal savings in prospect. Value Engineering spread like a tidal wave across the USA, and its spread reached Europe in 1960 [4]. A survey of several firm using value engineering in the United Kingdom indicated savings of the order indicated below

Types of product Saving %

Consumer 26 - 28
Light Engineering 29 – 32
Heavy Engineering 30 – 34
Source [4]

With the possibility being in the ranges indicated, one can expect savings of the order of 30% or more. [1] summarized the criteria for evaluating value as initial cost, energy cost, return in profit, function performance, reliability, maintenance-ability, quality, scalability, regard for aesthetics and environment, owner requirement and safety. The criteria used to determine the value of a product must be judged by the purchaser, by each individual, by the owner and partly by the design firm involved in the project.

[5], [6], [7] and [3] have all worked in the areas of eliminating waste, value-added manufacturing, life cycle costing. Just-In-Time manufacturing (JIT), and cost modelling, but the value engineering is new in developing countries like Nigeria. Therefore, the research focuses on using Value Engineering Analysis to look at the manufacturing industries in Nigeria using Akure Local Government area as a case study.

3. MATERIALS AND METHOD

A standard value engineering analyses questionnaire was developed to gather all the necessary information on the various operations such as: production processes, inventory, maintenance, manpower, labour, material purchase, energy and quality. The questionnaires were distributed to fourteen (14) selected medium/large scale manufacturing industries in Akure South Local Government Area of Ondo state of which only four (40 could be effectively used for the analysis despite the fact that the questionnaire were monitored in some of the companies. It was however, discovered that some of the questions were not understood by the Manager(s) and so only four (4) useful would be depended upon and used in this research.

In analysing the data collected, various statistical tools were available for simplifications and representation of the data like Pie chart, bar chart or Line graph. But the one used in this research is known as Cost-To-Worth Ratio Model (1 is assigned as the best Cost-To-Worth Ratio).

Cost is what we are paying for an item (engineering estimate)
Worth is the least cost for performing the function, what ideas do we have that will perform the function at a lower cost?

4. RESULTS AND DISCUSSION

After a thorough review of the completed questionnaire received from fourteen (14) companies, we are able to arrive at the tables of value called function/value analysis for four (4) different manufacturing companies. The following six areas were evaluated;

(i) Labour – skilled, semi-skilled, motivation and training
(ii) Inventory – ordering, set-up (transportation), holding and inspection.
(iii) Material - Purchase
(iv) Maintenance – Lubricant and parts, equipment, labour and Exports, preventive and cleaning
(v) Energy – fuel, maintenance and NEPA charge
(vi) Quality – Quality assurance (QA) and Quality Control (QC) and Rectification.

Table 1 shows the value analysis (cost-to-worth ratio) for medium scale manufacturing industry. A established in 1997. the labour has the total of 0.48 cost-to-worth ratio value, less attention are paid to unskilled labour, it is obvious that the company has taken the advantage of unemployment in the country which adversely affected their labour force. The inventory, of the company has cot-to worth ratio of 2.4 though the company has its materials source locally, yet the cost of ordering, transportation, and inspection all have higher values of cost-to-worth. The material purchase has a normal cost-to-worth ratio of 1.0 this alright for the company. Maintenance for the company has cost-to-worth ratio 2,0. it indicate unnecessary cost, despite the fact that all the parts and the experts to repair the machine are available locally.

The energy charge has cost-to-worth ratio of 2.36 which is considered to be high. The company experience about eight (8) hours failure from NEPA daily. This could be attributed to the escalated energy cost in terms of furl purchase. Quality has 2.0 cost-to-worth ratios. This can

still be improved upon to reduce the ratio value to normal.

Table 2 shows the value analysis (cost-to-worth) for large scale manufacturing industry B established in 1995. The labour has the total of 0.58 cost-to worth ratio value which is till less than 1.0 which is termed to be normal. This sis similar to the situation of manufacturing industry A. Inventory has 1.24 cost-to-worth ratio while the ordering cost material purchase had cost-to-worth ratio 1, 25. Maintenance has 1.96 cost-to-worth value. Maintenance experts are available partly in the local area and partly other parts of the country. The sources of the unnecessary costs need to be detected and removed. Energy has 2.6 cost-to-worth ratio values. Fuel has the highest value of cost-to-worth. The high energy value can be as a result of erratic NEPA power supply. from NEPA daily. Quality attracted 2.0 cost-to-worth ratio values. The quality section needs checking to remove their excesses.

Table 3 shows the value analysis (cost-to-worth ratio for medium scale manufacturing industry C established in 1992. The labour also like other earlier two companies has 0.75 cost-to-worth ratio value. This is an advantage on the part of the company but a cheat on the part of the workers. The inventory has 1.31 cost-to-worth ratios with ordering and inspection having the highest 2.5 cost-to-worth ratio value.

Material purchase has 1.67 cost-to-worth ratio values. The company source its raw materials from within Nigeria. Energy and maintenance havethe same 2.0 cost-to-worth ratio value. The same reason for manufacturing industries A and B holds for the greater value of cost-to-worth ratio value for energy and maintenance. It is a general phenomenon. The quality attracted 1.33 cost-to-worth ratio values which is also higher than the normal 1.0

Table 4 shows the value analysis (cost-to-worth ratio) for a large scale manufacturing industry D established in 1984. The labour has 0.71 cost-to-worth ratio value as usual which is a cheat on the labour in this country. Inventory has a total of 1.71 cost-to-worth ratio value despite the fact that the materials are sources locally. Material purchase has 1.25 cost-to-worth ratio values which is close to 1.0. Maintenance attracted 1.67 cost-to-worth ratio values with lubricant and parts and equipments having the highest cost-to-worth ratio. The spare parts are available locally and within the state, and the experts for repair and maintenance are sourced within Nigeria. The source of unnecessary cost should be found and eliminated. Energy has 2.46 cost-to-worth ratio values which is termed to be too high.

Quality also attracted 1.17 cost-to-worth ratio values which is very close to 1.0, it can still be improved upon to attain better result.

Fig. 1 shows the summary of the four manufacturing industries under discussion. It was however observed that all the four manufacturing industry under study has less than 1.0 cost-to-worth ratio value in the area of labour which shows a very good savings for the industries but a cheat on the labour market. The energy has the highest values, followed by inventory, then maintenance followed closely. The quality and material purchase presented the best cost-to-worth ratio values close to 1.0

TABLE 1:Value Analysis (Cost-to-worth ratio) Table for Manufacturing Industry A

		(N millions)		
Item	PART	COST	WORTH	COST/WORTH
1.	LABOUR			
	- Skilled	1.2	2.0	0.6
	- Semiskilled	2.0	4.5	0.44
	- Unskilled	2.5	6.0	0.042
	- Motivation & Training	0.5	0.5	1
	Total	6.2	13.0	0.48
2.	INVENTORY			
	- Ordering	0.5	0.2	2.5
	- Set up (transportation)	1.5	0.45	3.33
	- Holding	0.5	0.5	1
	- Inspection	0.5	0.1	5
	Total	3.0	1.35	2.4
3.	MATERIAL	20	20	1
	PURCHASE			
4.	MAINTENANCE			
	- Lubricant & Parts	0.5	0.3	1.67
	- Equipment	0.2	0.2	1
	- Labour & Experts	0.5	0.1	5
	- Preventive & Cleaning	0.2	0.1	22
	Total	1.4	0.7	2
5.	ENERGY			
	- Fuel	0.27	0.3	2.5
	- Maintenance	0.25	0.15	1.67
	- NEPA charge	0.3	0.1	3
	Total	1.3	0.55	2.36
6.	QUALITY			
	- QA & QC	0.2	0.1	2
	- Rectification	0.2	0.1	2
	Total	0.1	0.2	2

Source: From questionnaire distributed and collected.

TABLE 2:Value Analysis (Cost-to-worth ratio) Table for Manufacturing Industry B

		(N millions)		
Item	PART	COST	WORTH	COST/WORTH
1.	LABOUR			
	- Skilled	3.0	5.0	0.60
	- Semiskilled	1.5	3.0	0.50
	- Unskilled	1.0	2.5	0.40
	- Motivation & Training	1.2	1.0	1.2
	Total	6.7	11.5	0.58
2.	INVENTORY			
	- Ordering	1.0	0.5	2.0
	- Set up (transportation)	2.5	2.0	1.25
	- Holding	1.2	1.2	1.0
	- Inspection	0.2	0.25	0.8
	Total	1.9	3.95	1.24
3.	MATERIAL	1.5	1.2	1.25
	PURCHASE			
4.	MAINTENANCE			
	- Lubricant & Parts	0.75	0.3	2.5
	- Equipment	0.5	0.3	1.67
	- Labour & Experts	0.75	0.5	1.5
	- Preventive & Cleaning	0.75	0.5	1.5
	Total	2.75	1.4	1.96
5.	ENERGY			
	- Fuel	1.2	0.4	3.0
	- Maintenance	0.3	0.15	2.0
	- NEPA charge	0.45	0.2	2.25
	Total	1.95	0.75	2.6
6.	QUALITY			
	- QA & QC	2.0	1.0	2
	- Rectification			
	Total	2.0	1.0	2

Source: From questionnaire distributed and collected.

TABLE 3:Value Analysis (Cost-to-worth ratio) Table for Manufacturing Industry C

		(N millions)		
Item	PART	COST	WORTH	COST/WORTH
1.	LABOUR			
	- Skilled	1.5	6.0	0.75
	- Semiskilled	1.5	6.0	0.75
	- Unskilled	3.5	5.0	0.7
	- Motivation & Training	0.75	0.75	1.0
	Total	13.25	17.75	0.75
2.	INVENTORY			
	- Ordering	0.25	0.1	2.5
	- Set up (transportation)	2.5	2.0	1.25
	- Holding	1.0	0.75	1.33
	- Inspection	0.25	0.1	2.5
	Total	1	2.95	1.36
3.	MATERIAL	20	12	1.67
	PURCHASE			
4.	MAINTENANCE			
	- Lubricant & Parts	1.0	0.5	2
	- Equipment			
	- Labour & Experts	0.5	0.2	2.5
	- Preventive & Cleaning	0.2	0.15	1.33
	Total	1.7	0.85	2
5.	ENERGY			
	- Fuel	1.25	0.6	2.08
	- Maintenance	0.25	0.2	1.25
	- NEPA charge	0.5	0.2	2.0
	Total	2.0	1.0	
6.	QUALITY			
	- QA & QC	0.2	0.1	2
	- Rectification	0.2	0.2	1
	Total	0.4	0.3	1.33

Source: From questionnaire distributed and collected.

[7] American Institute of Architects (1997): Life Cycle Cost Analysis. A guide for Architects. M.A. Washington D.C.

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