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PRODUCTION MANAGEMENT INDICATORS AND UTILITY MAXIMIZATION OF SELECTED ALUMINUM FIRMS IN DELTA STATE, NIGERIA

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Abstract

The study was designed to investigate Production Management Indicators and Utility Maximization of Selected Aluminum Firms in Delta State, Nigeria. However, the objective of the study was to determine the influence of product count on consumer marginal utility of selected Aluminum firms in Delta State and examine the effect of product rate on consumers' satisfaction of selected aluminum firms in Delta State. A structural administered questionnaire was used as the research instrument. The population of this study was two hundred and ninety-three (293) respondents. The sample size were determined using Krejcie and Morgan, 1970 table of sample size determination as adopted from (Olannye, 2017) the sample size is One Hundred and Sixty nine ***(169)*** *questionnaire were administered to the staff of Hi-Tech Alumninum, Nefkon Aluminum Nigeria, Whictech Group Limited, Kimbo Aluminum Nigeria Ltd and Viscalo Aluminum Company . Out of which (157) 93% were submitted and properly filled while twelve (12) 7% were not submitted. The study adopted a descriptive research design the responds gotten from the structural administered questionnaire through Google form was coded in SPSS for data analysis. Data collected for the study will be analyzed using percentages, mean scores and frequencies. A mean value of 2.50 was used as a benchmark for the study. The study reveals that product count has influence on consumer marginal utility in Aluminum Companies as the grand mean obtained was 2.93 which is within judgment as the benchmark is 2.5 mean value. The study recommended that Customer orientation indicates utility maximisation and other marketing orientations play an indisputable role in production management in the modern and turbulent market environment.*

Keywords: *Production, Indicators, Utility, Maximization, Product Counts*

Introduction

Every organisation produces either goods or services and markets what it produces. These are the two basic things organisations do; some can be manufacturing or service organisations. Production is converting raw materials and other inputs into finished goods or services. The production combines various material and immaterial inputs (plans, know-how) to make something for consumption (output). It is the act of creating an output, a good or service which has value and contributes to the utility of individuals (Panesar, 2020).

Production management refers to the application of management principles to the production function in a factory. In other words, production management involves the application of planning, organising, directing and controlling the activities of the production process. It combines and transforms various resources used in the production subsystem of the organisation into value-added products in a controlled manner as per the organisation's policies. Buffa (2020) affirmed that production management is an organisational activity or process that deals with decision-making related to production processes so that the resulting goods or services are produced according to specifications, in the amount and by the schedule demanded and out of minimum cost. These performance indices for a given organisation can only be actualised if the consumers continually derive desired maximum satisfaction from the company's goods or services put forward in the market. However, everything about production management pervades consumers' decisions on whether to continue buying their products. It led to the problem faced by some organisations as it has an excellent impact on their profitability, market share, and business survival due to the need for a more effective production management structure. Against this backdrop, the study intends to investigate the relationship between production management indicators and utility maximisation.

Utility maximisation is a term used to describe a consumer's satisfactory response. Utility maximisation assesses a specific service/product feature (price, quality, or quantity) that provides a satisfying level of usage-related fulfilment, including varying levels of over- or under-fulfilment. It is also, in reality, a crucial factor in corporate success and production management. However, utility maximisation is a summary state of a psychological process. Mainly, satisfaction results at the end of customers'" processing activities and not necessarily when services" or product" outcomes are immediately observed (Soderlund, 2016). Most firms' ultimate goal today is to boost

productivity and revenues through system simplification, organisational potential and incremental improvements. Customer utility and satisfaction are thus critical to obtaining objectivity. However, most organisations must adapt to constantly changing client preferences, wants, tastes, and aspirations. Effective production management helps to improve an organisation's performance in terms of market share, growth and development with an increase in its profit margin. Competitive rivalry and ever-changing consumer requirements have proven to be an inexhaustible motivator of organisational performance development. To remain competitive and maintain a more significant market share in the global market, these firms must prioritise effective production management of their operational systems, including human resources and material management

Utility maximisation is a term used to explain satisfaction that allows the judgments of the satisfaction provided by products/services with lengthy consumption times and rapid judgments of satisfaction resulting from quickly consumed products like candy bars.

However, with time, production management has undergone many changes. It is no longer a department churning out promotional materials, but it has now become the nerve centre of the organisation.

Production management involves a series of production planning, a process in which organisations specify how they will deploy their production resources to meet short- and long-term forecasts. Production management entails the installation of administrative machinery to fulfil a company's future product demands while capturing mid- to long-term production resources to meet client demand. In other words, a successful and efficient mix of human and non-human resources is anticipated to meet customers' expectations. This paper reviews the production management indicator and utility maximisation to improve productivity and customer satisfaction.

Objectives of the study

The general objective of the study is to investigate production management indicators and utility maximization. However, the specific objectives are to:

i. Determine the influence of product count on consumer marginal utility of selected aluminum firms in Delta State

ii. Examine the effect of product rate on consumers' satisfaction of selected aluminum firms in Delta State.

Research Questions

1. How does product count influence on consumer marginal utility of selected aluminum firms in Delta State?
2. What is the effect of product rate on customers' satisfaction of selected aluminum firms in Delta State?

Literature Review

Production Management

The Concept of Production Management, according to Kosasih (2012), noted that an operations or production process in an organisation of both manufacturing and service also has two essential elements, namely:

1. **Key requirement**. That is to say; in the running of a process or activity, operations should seriously do a blessed transformation process of the shape of the material into a finished product and avoid the occurrence of irregularities and mistakes as a process run boils down to one goal (i.e. the fulfillment of basic human needs or consumers). In order to create a product or service to meet the needs of consumers, it takes all the elements in the process of transformation so that the resulting product or service into something complete, satisfying consumers and utility maximisation.

2. **Sufficient requirement**. The operation's activities will create a value object in the transformation; the meaning is that before and after the transformation is performed, the difference can be measured and known, and the differences that appear can provide added value to the object we call the condition enough. A person's expertise will appear clearly through the eye if the person concerned is related to a tool or is operating a work tool that has made him an expert. The inherent expertise of humans or individuals is not attached to the product. Someone is said to be a musician when he is playing a musical instrument, and someone is said to be adept at driving when someone is driving a vehicle, but when someone is silent and not doing something, his expertise is not visible.

Utility maximisation is central to organisational success, and the principal goal of most business organisations is to maximise profits while minimising costs. As such, organisations can realise profit maximisation by increasing sales. In that case, utility maximisation is critical in increasing sales through repeated buying and consumer loyalty (Viswanathan & Venugopal, 2015).

Brech(2019) defines production management as "The process of effective planning and regulating the operations of that section of an enterprise which is responsible for the actual transformation of materials into finished products." This definition emphasises the transformation process of inputs into outputs. Production management is an organisational life cycle function within a company dealing with the planning or marketing of a product or products at all stages of the product life cycle.

Utility Maximisation Model

Utility maximisation is an essential reason for increasing the income of companies. Also, many factors can improve customer satisfaction and work to enhance (Ajit &Subhash, 2013). Factors such as price-quality can improve customer satisfaction (Fornell et al., 2016). Product quality, service quality, and the marketplace strongly correlated with customer satisfaction. Customer satisfaction helps businesses to grow (Kumar, 2016). Also, Customer satisfaction is an essential factor for the economy.

Utility maximisation Kotler & Keller (2012) said that "satisfaction is a person's feelings of pleasure or disappointment that result from comparing a product's perceived performance (or outcome) to expectations". According to Jahanshahi et al. (2011), utility maximisation is "the result of a customer's perception of the value received in a transaction or relationship - where value equals perceived service quality relative to price and customer acquisition costs". However, this is in contrast with the research of Tu et al. (2013), which indicated that "utility maximisation is viewed as influencing repurchasing intentions and behaviour, which, in turn, leads to an organisation's future revenue and profits".

Product Count and Consumers' Marginal Utility.

Taxes levied by the government or royalties owed by natural resource-extraction companies are also treated as production costs. Once a product is finished, the company records its value as an asset in its financial statements until the product is sold. Recording a finished product as an asset fulfils the company's reporting requirements and informs shareholders that this can be a determinant of product count (Corporate Finance Institute, 2021).

Product count refers to all of the direct and indirect costs businesses face from manufacturing a product or providing a service. Production count can include various expenses, such as labour, raw materials, consumable manufacturing supplies, and general overhead. Product counts, or product costs, are incurred by a business when it manufactures a product or provides a service. These costs include a variety of expenses. For example, manufacturers have production costs related to the raw materials and labour needed to create the product. Service industries incur production costs related to the labour required to implement the service and any materials costs involved in delivering the service. (C. F. I., 2021).

Product Rate and Consumers' Satisfaction

Production rate, in terms of production management, refers to the number of goods produced during a given period. Alternatively, the production rate is also the amount of time it takes to produce one unit of a good. Companies often strive for high production rates to help lower the time and cost of a project or the production process. However, a higher production rate can also lead to a decrease in quality if more mistakes are made as employees push to have more units produced or more of a building completed. As a result, there is a point in the process where a decrease in quality can lead to higher costs, even if the production or construction process takes minimum time. Both internal and external factors can impact the production rate. If there is no adequate training of employees or enough skilled personnel to perform the production work, the production rate will likely decline. Outside factors can also affect the production rate of any operation (Belz & Peattie, 2009).

However, the product and its features, functions, reliability, sales activity and customer support are the most important topics required to meet or exceed the satisfaction of the customers. Satisfied customers usually rebound and buy more. Besides buying more, they also network to reach other potential customers by sharing experiences (Hague & Hague 2016.) The value of keeping a

customer is only one-tenth of winning a new one. Therefore, when the organisation wins a customer, it should continue to build up a good relationship with the client. Providing the quality of goods and services in the 20th century is not only to satisfy the customers but also to have a safe position. Indeed, this has benefited the customers significantly in consuming qualitative products (Rebekah & Sharyn 2014.)

Theoretical Review

The theory of utility is used in economics to model worth or value. Its application has changed dramatically over time. Moral philosophers such as Jeremy Bentham and John Stuart Mill first used the word as a measure of pleasure or happiness within utilitarianism. Within neoclassical economics, which dominates current economic theory, the word has been altered and reapplied as a utility function that expresses a single consumer's preference ordering over an option set but is not comparable across customers. This definition of utility is more precisely described than the original concept. However, it is less valuable (and disputed) for ethical issues because it is personal and based on choice rather than pleasure experienced. The theory states as follows: A utility function can represent that ordering if it is possible to assign an actual number to each alternative in such a way that alternative a is assigned a number greater than alternative b if and only if the individual prefers alternative a to alternative b. In this situation, someone who selects the most preferred alternative is necessarily also selecting the alternative that maximises the associated utility function. In general economic terms, a utility function measures preferences concerning a set of goods and services. Often, utility is correlated with concepts such as happiness, satisfaction, and welfare, which are hard to measure. Thus, economists utilise consumption baskets of preferences to measure these abstractions; no quantifiable ideas have precisely defined the conditions required for a preference order to be represented by a utility function. (Gérard Debreu 1954)

Empirical Review

Uzorh et al. (2017) conducted a quantitative analysis of some factors influencing the performance of manufacturing workers in industries in southern and eastern Nigeria. Experiments were designed and carried out with the help of work measurement techniques and test studies. Data was gathered

for analysis. SPSS was the software used. Statistics, correlation, multi-linear regression, response surface regression, and linearity diagnoses are among the software tools used in the study for various analyses.

In contrast, the hypotheses were tested using the t - value, F - ratio, p - values, and variance of inflation factors (VIF). The results of the various statistical analyses were presented, studied, and interpreted. Maintenance, equipment, Power/Energy, technology, safety, and training have positive correlation coefficients in descending order. For strong inference, the coefficient of determination, R2, and the variance ratio (VR), as well as the F-value and t-coefficient values, were calculated. Curves were created to observe the behavioral patterns of the relationship between manufacturing workers' factors and their influence on performance. The findings revealed that the identified factors influenced the performance of manufacturing workers in the manufacturing industries in such a way that some factors positively impacted the company's productivity while others negatively impacted it. In general, the factorial indices that predicted manufacturing workers' performance of the selected factors: motivation, power, safety, maintenance, training, equipment, and technology were found to be 0.877, 0.48, 0.614, -1.36, 0.789, 1.421, and - 0.495, respectively. These factorial indices are effective in dealing with problems that arise from manufacturing industries

Fölting et al., (2019), examined user preferences for various types of information provided by such apps. For 330 consumers, they conducted an adaptive choice-based conjoint analysis and a between-subject experiment. Since Product information and Smartphone price comparison apps are becoming increasingly important in consumers' purchasing decisions. Consumers can select from a variety of product information search applications (apps), which primarily differ in terms of the information provided to them during their search process. They distinguish between products with high and low involvement. Individual differences are explained using psychometric latent constructs. Our findings show that preferences vary by product category. Consumer attitudes such as quality vs. price consciousness and green consumer values influence the valuation of specific information types.

Dolak et al., (2020) investigated preference heterogeneity among Slovenian energy consumers in order to determine how different consumer groups value different energy products and service

attributes. Its specific goal is to determine whether a consumer segment with a preference for additional energy services—particularly those associated with energy-efficient and green behavior—can be identified. To categorize consumers based on their preferences for energy services, a latent class analysis is used. Furthermore, data on their attitudes and behavior toward green energy and energy efficiency, energy consumption, and use of energy services, as well as socioeconomic characteristics, are used in the latent class regression to explain differences between latent consumer classes. There are three types of consumers identified: regular consumers, energy-efficient consumers, and dissatisfied consumers.

Energy-efficient consumers are significantly more interested in additional services, energy efficiency, and green energy than regular and dissatisfied consumers. Suppliers should tailor marketing strategies to meet the needs of specific segments, in line with the heterogeneity of consumer preferences. To increase the effectiveness of energy efficiency policies, energy policymakers must also pay more attention to consumer heterogeneity and behavioral changes.

Razak et al., (2017) investigated product quality and price towards utility maximisation and tested the mediating role of customer value in improving customer satisfaction. This research studies perception and causality for the customers of toothpaste as a convenience product. The uniqueness of this research is in the primary focus, which is the study of the customer value perception for toothpaste products as a convenience product for the metropolitan community. This paper is a quantitative study using a survey method based on the positivism paradigm. Structural Equation Modeling is also used for inferential statistics. The population of this study is the customer of toothpaste products over the age of 17 and domiciled in Bekasi, Indonesia. Likert scale questionnaires were also distributed to 100 mall visitors as part of this research. Purposive sampling, on the other hand, is used, with the selected individuals adhering to the research criteria. The study discovered that the functional value of the toothpaste product purchased by the customer is not optimal yet to be a significant consideration in satisfying the customers; it is precisely the quality of the toothpaste product itself that conforms to the production standard in advance.

Methodology

The sampling object of the study is the staff of Hi-Tech Aluminum Industries, Nefkon Aluminum Nigeria, Whictech Group Limited, Kimbo Aluminum Nigeria Ltd and Viscalo Aluminum Company which their responses was collected with aid of structured questionnaire. The population of this study was two hundred and ninety-three (293) respondents. The sample size were determined using Krejcie and Morgan, 1970 table of sample size determination as adopted from (Olannye, 2017) the sample size is One Hundred and Sixty nine (**169)** respondents. The study used primary data, and the instrument for the data collection was a structured questionnaire and; this questionnaire was designed and sent electronically through Google Forms to the above understudied companies.

The study adopted a descriptive research design the responds gotten from the structural administered questionnaire through Google form was coded in SPSS for data analysis. Data collected for the study will be analysed using percentages, mean scores and frequencies. A mean value of 2.50 was used as a benchmark for the study. It therefore, implies that if collated responds are less that 2.50 mean values it will be rejected, while anything more or equal will be accepted. The questionnaire consists of close-ended items for respondents to choose their responses from the answers provided. The structured questionnaires were built on a four-point scale: Strongly Agreed () Agreed ( ) Undecided (U) Strongly Disagreed () Disagreed ( ). The instrument consists of two sections, A and B. Section A deals with the demographic background information of the respondents. Section B contains items that dwell on specific objectives and research questions. However, out the one hundred and sixty nine (169) questionnaires administered, one hundred and fifty seven (157) were returned

Data Presentation, Analysis and Interpretations

Section A of the questionnaire, which deals with the respondents' demographic data, will take the highest percentage (%) of respondents as the decision rule. While section B's decision rule was based on mean cut-off points of 2.5, which will be the lowest actual unit of the Agree Category. A mean of 2.5 and above is regarded as acceptable. It positively affects production management

indicators and utility maximisation in selected Aluminum Firm Delta State, Nigeria. A mean cut-off point below 2.50 is considered unacceptable to enable proper decision output and interpretations of the questions from the respondents in the structural self-administered questionnaire.

Allocation of Sample Size according to selected Firms

S/N	Names of Firms	Population	Sample Size Per Firm ($n_i = N_i / N * n$)
1	HI-Tech Alumninum	50	50/293 *169 = 29
2	Nefkon Almninum	46	46/293 * 169 = 27
3	Whictech Group Ltd	56	56/293 * 169 = 32
4	Kimbo Alumninum	82	82/293 * 169 = 47
5	Viscalo Alumninum	59	59/293 * 169 = 34
	Total		**169**

Demographic Variable Analysis of Section A

Gender		
Variable	**Frequency**	**Percentage**
Male	85	54
Female	72	46
Total	**157**	**100**
Categories Employee		
Staff	47	30
Field Work	71	45
Others	39	25
Total	**157**	**100**
Age Distribution		
17-22 Years	5	3
23-26 Years	58	37
27-32 Years	28	18
33 Years and above	66	42
Total	**157**	**100**

Source: Field Survey, 2024

Interpretation

Table 1 represents the distribution of gender of the respondents; 85 (54%) were male, while 72 (46%) were female because Production industries have a higher male workforce than female.

The table above indicates the categories of employees who responded to the structurally administered questionnaire. Out of the 157 retrieved, 47 (30%) were staff, 71 (45%) were Field workers, and others comprised casual workers, drivers, gatekeepers, and cleaners. In comparison, 39(25%) categories were others

The table above signifies the age distribution of the respondents: 17-22 years are 5 (3%), 23-26 years are 58(38%), while 27-32 years 28 (18%), while 33 years and above 66(42%) of the respondent.

SECTION B: Analysis and Presentation of Data

Question 1) How does product count influence on consumer marginal utility?

S/N	Items	SA	A	UD	D	SD	Mean	Remark
1.	Product's value	14 (18.2%)	12 (15.6%)	12 (15.6%)	20 (26.0%)	19 (24.7%)	2.77	Accept
2.	Royalties	25 (32.5%)	9 (11.7%)	6 (7.8%)	6 (7.8%)	30 (39.0%)	2.91	Accept
3.	Recording	43 (55.8%)	11 (14.3%)	9 (11.7%)	4 (5.2%)	10 (13.0%)	3.95	Accept
4.	Direct and indirect costs	14 (18.2%)	7 (9.1%)	6 (7.8%)	3 (3.9%)	47 (61.0%)	2.19	Reject
5.	Raw materials	31 (40.3%)	13 (16.9%)	15 (19.5%)	12 (15.6%)	6 (7.8%)	3.66	Accept
6.	Labor	38 (49.4%)	16 (20.8%)	10 (13.0%)	6 (7.8%)	7 (9.1%)	3.94	Accept
7.	Satisfaction	30 (49.4%)	3 (2.6%)	4 (5.2%)	2 (3.9%)	38 (39.0%)	2.81	Accept
8.	willingness to purchase	32 (41.6%)	12 (15.6%)	23 (29.9%)	4 (5.2%)	6 (7.8%)	3.78	Accept
9.	consumers choices	23 (29.9%)	18 (23.4%)	18 (23.4%)	11 (14.3%)	7 (9.1%)	3.51	Accept
10.	limited budgets	41 (53.2%)	6 (7.8%)	8 (10.4%)	9 (11.7%)	13 (16.9%)	3.69	Accept
	TOTAL							
	GRAND MEAN						**2.93**	Accept

Source: Field Survey, 2024

Interpretation

The table above represents the question and items from research question 1. It was observed that the mean value obtained from direct and indirect costs was 2.19, which is below the 2. 5 mean value decision rule; it, therefore, implies that direct and indirect costs as a variable of product count do not influence consumer marginal utility of aluminum companies. Nonetheless, every other response was above the 2.5 mean value. Nonetheless, every other response was above the 2.5 mean value. Notably, the grand mean for the table was 2.93which is above 2. 5 mean value decision rule, this implies that the question "How does product count influence on consumer marginal utility?" is valid.

Question 2) what is the effect of product rate on customers' satisfaction?

S/N	Items	SA	A	UD	D	SD	Mean	Remark
1.	number of goods produced	12 (15.6%)	10 (13.0%)	15 (19.5%)	20 (26.0%)	20 (26.0%)	2.66	Accept
2.	cost of a project	37 (48.1%)	12 (15.6%)	7 (9.1%)	8 (10.4%)	13 (16.9%)	3.68	Accept
3.	decrease in quality	26 (33.8%)	12 (15.6%)	5 (6.5%)	3 (3.9%)	31 (40.3%)	2.99	Accept
4.	more units produced	5 (6.5%)	2 (2.6%)	2 (2.6%)	1 (1.3%)	67 (87.0%)	1.40	Reject
5.	higher costs	21 (27.3%)	10 (13.0%)	13 (16.9%)	16 (20.8%)	17 (22.1%)	3.03	Accept
6.	consumption experience	31 (40.3%)	21 (27.3%)	10 (13.0%)	5 (6.5%)	10 (13.0%)	3.75	Accept
7.	total purchase	32 (41.6%)	14 (18.2%)	9 (11.7%)	4 (5.2%)	18 (23.4%)	3.87	Accept
8.	Customer's expectation	33 (42.9%)	16 (20.8%)	20 (26.0%)	1 (1.3%)	7 (9.1%)	3.49	Accept
9.	customer retention	24 (31.2%)	16 (20.8%)	18 (23.4%)	9 (11.7%)	10 (13.0%)	3.45	Accept
10.	customer behavior	15 (19.5%)	2 (2.6%)	2 (2.6%)	2 (2.6%)	56 (72.7%)	1.94	Reject
	TOTAL							
	GRAND MEAN						**3.03**	Accept

Source: Field Survey, 2023

Interpretation

The table above represents the question and items from research question 2. It was observed that the mean value obtained from more units produced was 1.40 which is below 2. 5 mean value decision rule, it therefore implies that more units produced as a variable of product rate has no effect on customers' satisfaction. It was also observed that the mean value obtained from customer behavior was 1.94which is below 2. 5 mean value decision rule, it therefore implies that as a variable customers' satisfaction, customer behavior is not affected by product rate. On the other hand, every other responds were above 2.5 mean value. Notably, the grand mean for the table was

3.03which is above 2. 5 mean value decision rule, this implies that the question "What is the effect of product rate on customers' satisfaction? Is valid

Discussion of findings

Table 1 of the study represent question 1 and items which reveals that product count has influence on consumer marginal utility in aluminium company as the grand mean obtained was 2.93which is within judgment as the benchmark is 2.5 mean value. This is in agreement with Söderlund, (2016) which stated that people will continue consuming more of a good as long as the marginal utility is greater than the marginal cost. In an efficient market, the price equals the marginal cost. That is why people keep buying more until the marginal utility of consumption falls to the price of the good.

Table 2 was also within judgment as the grand mean was 3.03on effect of product rate on customers' satisfaction in Aluminium Company. This is in line with Hague & Hague (2016) which affirmed that the product and its features, functions, reliability, sales activity and customer support are the most important topics required to meet or exceed the satisfaction of the customers. Satisfied customers usually rebound and buy more. Besides buying more they also work as a network to reach other potential customers by sharing experiences.

Conclusions and Recommendations

Customer orientation indicates utility maximisation and other marketing orientations play an indisputable role in production management in the modern and turbulent market environment. To obtain as much information as possible on our consumers, which will determine utility maximisation, is fundamental to understanding their requirements. To see to what extent our companies and firms meet the customer requirements. It is necessary to conduct customer satisfaction surveys regularly or, even better, constantly. The reformulated model of customer orientation and the different measurement techniques of customer satisfaction and value customers, like the importance-satisfaction matrix and the Miskolc model can facilitate the implementation of a customer-oriented marketing strategy. This work thus can contribute to both the literature and the practice of production management and utility maximisation.

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