Effect of Management Policies on Fabrication of Subsea Equipment: A Case Study.

Onyedikachi, O. J., Ukpaka C. P., and Nkoi, B.
Department of Mechanical Engineering, Rivers State University, Port Harcourt, Nigeria.
onyedikachi.oluchi@gmail.com +234(0)8037243490

ABSTRACT

Management policies determine how activities and routine operations are carried out in an organization. The reason for management policy on fabrication is to ensure the objectives of an organization are accomplished for the smooth operation of the fabrication process. The aim of this research is to determine the management policies that could affect the fabrication of subsea equipment. Correlation and multiple regression analysis was carried out using MATLAB to analyze the relationship between management policies and the fabrication of subsea equipment. The result of correlation analysis for Nigerian Content policy and fabrication of subsea equipment shows a positive weak strength linear relationship. The result of correlation analysis for Community Affairs policy and the fabrication of subsea equipment shows a positive weak strength linear relationship. The result of correlation analysis for Health Safety Environment policy and the fabrication of subsea equipment shows a minimal positive weak strength linear relationship or no relationship at all. The result of multiple regression analysis for Nigerian Content policy and the fabrication of subsea equipment reveals a nonsignificant relationship between them. The result of multiple regression analysis for Community Affairs policy and the fabrication of subsea equipment reveals a nonsignificant relationship between them. The result of multiple regression analysis for Health Safety Environment policy and the fabrication of subsea equipment reveals a nonsignificant relationship between them. This research will provide a basis for oil and gas fabrication companies to review enacted policies to find out the ones not achieving its objectives and amend it.

KEYWORDS: Management Policies, Subsea Equipment, Correlation Analysis, Multiple Regression Analysis, Fabrication.

Cite This Paper: Onyedikachi, O. J., Ukpaka C. P., & Nkoi, B. (2021). Effect of Management Policies on Fabrication of Subsea Equipment: A Case Study. *Journal of Newviews in Engineering and Technology*. 3(3), 63 – 73.

1.0   INTRODUCTION

Management is universal. It is a term widely used to describe an activity, a process, and a group of people vested with the authority to make decisions. It is an essential element of every organized activity irrespective of the size or type of activity. All organizations whether business, political, cultural, or social are involved in management because it is management that helps to direct the various efforts towards a definite purpose. Policy in management of an organization is a general statement that is formulated by an organization for the guidance of its workers. It is the process of creating, communicating, and maintaining policies and procedures within an organization. The objectives of an organization are first formulated and then policies are planned to achieve them. The objectives are the goals and the policies are the ways to achieve them. The purpose of policies is to ensure that there is no deviation from the planned course of action, to ensure proper delegation of authority, and ensure consistency of action.

Autumn (2018) stated that policies and procedures are an essential component of any organization. The researcher stated that policies are important because they address pertinent issues, such as what constitutes acceptable behavior by employees. It is noted that procedures, on the other hand, clearly define a sequence of steps to be followed in a consistent manner, such as how the organization will respond to any policy violations.

The study shows that policies and procedures are rendered useless if employers neglect to adhere to them or fail to effectively communicate them to employees. Utilizing both policies and procedures during decision-making ensures that employers are consistent in their decisions. The study observed that the difficult part of policy formulation is policy implementation.

Knoepfel *et al*. (2011) studied evaluating policy effects and mentioned that policy impacts and outcomes concern the real effects of a policy in an organization. They stated that the impacts represent the real effects that policies trigger among the target groups and the question in this context is whether the implementation of the policy gives rise to the desired behavior changes or the stabilization of behavior. The outcomes of policy were defined as all of the effects concerning the problem to be solved that are attributable to the policy and triggered in turn by the implementation acts called outputs. It is stated in the study that outcomes of the policy include all effects which are desired and undesired effects, direct and indirect effects, primary and secondary effects, etc. It is noted that the objectives of a policy do not provide any indications on the existence of outcomes or effects of the policy. The study stated that the real effects of a policy may be deduced through highly specific research. Evaluative research makes a distinction between three types of criteria for appreciating the effects of a policy which are the extent of impacts analyses, action plans, and outputs produced; the effectiveness of the policy which relates to the observable outcomes with the aimed objectives; and the efficiency of the policy that compares the outcomes with the applied resources. The study noted that an evaluation may also analyze the relevance of the policy as regards the relationship between the objectives and the problem to be solved, and the relationship between the outputs and resources deployed.

Elliot (2015) in the study of impact evaluation described the impact of policy or programs as having either positive or negative effects, primary or secondary long-term effects, direct or indirect effects, and intended or unintended effects. The study mentioned that impact evaluation seeks to demonstrate that intended results follow from policy or program activities whether directly or indirectly. The study stated that the focus on impact has been given greater urgency by resource constraints and political demands for more accountability and transparency. The researcher noted that impact evaluation tries to link policy causes with policy results and it tries to find out whether a policy or program as a cause can be linked to identifiable and intended effects.

Anderson (2018) researched the effective implementation of organizational policies and procedures in Nigeria business and stated that forces and trends such as environmental, economic, political, sociological, psychological, technological, legal, and ethnical factors must be taken into consideration while formulating policies that can facilitate the accomplishment of the overall objectives and goals of the organization. The study stated that for effective implementation of organizational policies, three decisions have to be made which are in the area of planning, effective management, and operational control. The study noted that clear, precise, and written down policies lead to effective policy implementation.

Akpanika (2012) researched the technology transfer and the challenges of local content development in the Nigerian oil industry and mentioned that the oil and gas industry is largely driven by foreign technology. The researcher classified the national government's involvement into three distinct eras which are the era of royalty, the era of shareholding, and the era of active involvement where the government wants the involvement of indigenous people through the encouragement of indigenous participation in oil and gas operations.

The researcher looks at technology as a factor of production which can be sold and bought in the market and regard technology transfer as a means by which third world countries can catch up with their developed counterpart. The multi-national companies are seen as agents of technology transfer and which brings development to the nation. The study explained that the Nigerian local content policy was made to create a multiplier effect on the economy thereby enhancing sustainable growth. The study identified the challenges to Nigerian local content policy as infrastructure and macroeconomic challenge, institutional challenge, and social infrastructure and attitudinal challenge. The researcher concluded that local participation, through the local content program, will facilitate economic growth and national development through the reduction in capital flight abroad, employment generation, creation of better infrastructure in society, enhancement of local skills, and value-added to the local economy.

Ihua (2010) investigated the impact of Nigeria's oil and gas industry local content policy and its implications for promoting higher participation of indigenous small to medium-sized firms within the industry. The study reveals that the local content policy has not yet achieved significant success in enhancing: higher indigenous participation, use of local technology, higher contract awards to indigenous firms, and stimulating joint venture arrangements between indigenous and foreign oil firms. The study specifically identified issues such as lack of the local content act, cumbersome prequalification and entry requirements, underfunded and ill-equipped educational institutions, non-interference attitude of multinationals, ineffective monitoring and control by regulatory authorities, and inadequate financing options for indigenous small and medium-sized enterprise still hinder the policy efficacy. The study concluded that local content policy has had very little positive implication in enhancing higher small and medium-sized enterprise participation in the industry. Therefore, the following was

highlighted; the need for the enactment of the local content act to help put the reforms in the industry into action; more effective supervision and monitoring of the policy guidelines by regulatory authorities; lessening the pre-qualification requirements and the conditions for tenders and bids; the need to invest massively in the educational system, in order for the tertiary institutions to be able to produce the needed quality of graduates; reduction in the registration fees charged by regulatory authorities such as Department of Petroleum Resources (DPR) and National Petroleum Investment Management Company (NAPIMS); the provision of needed social and infrastructural support systems, in order to help reduce the cost of doing business and encourage a more friendly business climate; the access to financial instruments for small and medium-sized enterprise operating in the industry, in terms of providing access to single-digit financing for projects; and the facilitation of quality partnerships and alliances that can enhance higher levels of technology transfer and capacity building.

Olutuase (2014) in a study of safety management in the Nigerian construction industry stated that Nigerian construction firms especially the multinational companies seem to have safety policies gotten from their parent companies but still record repeated cases of accidents and injuries which include fall from a height, trapped by something either collapsing or overturning, struck by a moving vehicle, contact with an electrical discharge, struck by flying or falling object during machine lifting of materials, contact with operating machinery or material being machined, exposure to a hot or harmful substance or fire outbreak in the company. The study further stated that the problem is not the level of awareness of the importance of safety neither is it an absence of safety policy but it is more related to poor or lack of implementation of safety policies. The researcher stated that policies and programs of the safety management system of construction firms are naturally expected to lead to highly safe construction sites if they are well implemented.

The study stated further that the implementation of the Health Safety Environment must be effectively executed and closely monitored by the Health Safety Environment department. The study concluded that the Health Safety Environment policies must be in line with best global practices, international standards, national and industry requirements, and local laws.

Musah (2017) stated that the federal government of Nigeria, host communities, and oil companies are the key stakeholders in Nigeria's oil and gas industry. The researcher stated that Nigeria's oil and gas industry has an interdependent relationship with the oil companies and their host communities. This interdependence arises from oil companies' reliance on the natural resources in the environment of the host communities for their business activities. The host communities provide space for the equipment used in the company and also the residence for the human resources of the oil companies, to enable them to operate successfully. In return, the oil companies provide social services for these host communities. The researcher further stated that though it is the government's responsibility to provide development for its citizens, it has failed to do so over the years thereby making the host communities in the oil-producing areas depend largely on oil companies for their development. But many times, the development expectations of the host communities have not been met by the oil companies resulting in disagreements or conflict. The study noted that when conflict occurs, it is expected that appropriate measures are taken to control it from becoming a crisis and this can be achieved where policies are put in place to proactively nurture the relationship between host communities and the oil and gas companies. The study concluded that it is important for the oil and gas companies to know the host communities, use available local financial organizations and professionals for business transactions, state the specific objectives that harmonize the company's financial competence and the host community's expectations, periodically review organizations policies, and practices as trends in the host

community and its surrounding evolve, evaluate waste disposal, employee recruitment, and employment policies, distribute corporate donation and aid to the community in need according to Community Affairs policies and objectives.

Ogbemi (2020) stated that the exploration activities of oil companies in the Niger Delta have affected the host communities in a negative way which has resulted in conflicts between the oil-producing communities and oil companies owning to the activities of the companies. The study noted that the activities of the oil and gas companies have resulted in environmental degradation, pollution, poverty, unemployment, low level of social development, oil spillages, destruction of aquatic life and crops, etc. The study further noted that these host communities have expressed their anger through violent protest which results in the shutdown of oil facilities, destruction of properties, kidnapping of their staff, destruction of oil facilities, and clashes between the host communities and security operatives. The study identified the use of alternative dispute resolution, communication, preventive public relations and corporate social responsibility as conflict management strategies in the oil production areas of the region in order to manage conflicts between oil companies and their host communities. The study concluded that the host communities agreed that they have positive attitudinal disposition towards corporate social responsibility programmes of oil companies towards conflict management.

Putri et al. (2018) in the study of the effect of occupational health and safety, work environment, and discipline on employee performance in a consumer goods company noted that employee performance can be affected by an unsafe environment. Employees can only perform well if they feel safe and have a good working environment.

The study concluded that upgrading employee performance can be done by improving their level of discipline in implementing health and safety policies in addition to making sure that they get health and safety insurance in their workplace and have a good working environment.

2   MATERIALS AND METHODS

The materials used in this research consist of organizational records collected from the organization and the website, journals, and questionnaire distributed to get the views of the respondents.

2.1   Materials

The data for this work was obtained from an oil and gas fabrication company. The company is a local content company founded in 1999 and later became an indigenous company in 2007. It is an oil servicing company that specializes in the fabrication of topsides, bridges, decks, process skids, jackets, pressure vessels, riser protectors for floating production storage and offloading vessels (FPSO), flare booms and living quarters, manifolds, control modules, jumpers, sledges, suction piles, pipeline end terminations (PLET)/pipeline end manifold (PLEM), and Christmas tree elements for subsea developments. Data was obtained using self-structured questionnaire rated on a modified 4- point Likert Scale. Data collected was analyzed using Microsoft Excel and MATLAB (R2018a). Correlation analysis was used to determine the relationship between the management policies and the fabrication of subsea equipment, and multiple regression analysis was used to determine the effect of management policies on the fabrication of subsea equipment.

2.2   Analytical Model

The correlation coefficient equation is as shown in equation (1)

$$r_{xy} = \frac{\sum(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum(x_i - \overline{x})^2 \sum(y_i - \overline{y})^2}} \qquad (1)$$

Where:
r_{xy} = Correlation coefficient

x_i = x variable in a given sample

y_i = y variable in a given sample

$\overline{x}$ = Mean of x variable

$\overline{y}$ = Mean of y variable

To calculate the correlation coefficient using the above formula, the mean $\overline{x}$ for the x-variable and the mean $\overline{y}$ for the y-variable must be determined. The equation to calculate the mean is shown below:

$$\overline{x} = \frac{\sum x}{N} \qquad (2)$$

$$\overline{y} = \frac{\sum y}{N} \qquad (3)$$

Where:
$\overline{x}$ = Mean (average) of x variable
$\overline{y}$ = Mean (average) of y variable
$\sum x$ = Sum of x variable
$\sum y$ = Sum of y variable
N = Total number of x or y variable

To calculate the multiple regression, the equation is as shown in equation (2)

$$y = b_o + b_1 x_1 + b_2 x_2 + b_3 x_3 + e \qquad (4)$$

Where:
x = Independent Variables (Management Policies)
y = Dependent Variable (Subsea Equipment i.e., Production Manifold)
b_1 = Regression Coefficient / Slope Parameters
b_o = The 'y' Intercept / Regression Constant
e = Error

To find the slope, the equation is as shown in equation (5)

$$b_1 = \frac{(\sum y)(\sum x_2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2} \qquad (5)$$

Where:

x = Independent Variables (Management Policies)

n = Sample Size

To calculate the intercept, the equation is as shown in equation (6)

$$b_0 = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x_2) - (\sum x)^2} \qquad (6)$$

Where:

b_0 = The 'y' Intercept / Regression Constant

To find error, the equation is as shown in equation (7)

$$e = y - b_0 - b_1 x_1 - b_2 x_1 - b_3 x_3 \qquad (7)$$

To calculate the statistical significance in the model, the equation is as shown in equation (8)

$$t = \frac{(\bar{x} - \mu_0)}{\left(\frac{s}{\sqrt{n}}\right)} \qquad (8)$$

Where:

$\bar{x}$ = Sample Mean

μ_0 = Hypothesized Population Mean

s = Sample Standard Deviation

If $p \leq 0.05$, it is statistically significant. It shows strong evidence against the null hypothesis. The null hypothesis is rejected, and the alternative hypothesis is accepted.

If $p > 0.05$, it is not statistically significant and shows strong evidence for the null hypothesis. The null hypothesis is retained and the alternative hypothesis is rejected.

The null hypothesis (H0) and alternative hypothesis (H1) is as written below:

Hypothesis H01 = There is no relationship between management policies and the fabrication of subsea equipment.

Hypothesis H11 = There is a relationship between management policies and the fabrication of subsea equipment.

Hypothesis H02 = There is no significant effect of management policies on the fabrication of subsea equipment.

Hypothesis H12 = There is a significant effect of management policies on the fabrication of subsea equipment.

3. RESULTS AND DISCUSSION

The correlation coefficient of the data was computed and executed to examine the relationship between each of the independent variables and the dependent variable. A correlation matrix was obtained and shown in Table 1.

Table 1: Correlation Coefficient Matrix of Independent and Dependent Variables

Variables	Correlation Coefficient (r)		Probability Value	
x1_y	1.0000	0.1261	1.0000	0.5964
	0.1261	1.0000	0.5964	1.0000
x2_y	1.0000	0.1707	1.0000	0.4718
	0.1707	1.0000	0.4718	1.0000
x3_y	1.0000	0.0744	1.0000	0.7553
	0.0744	1.0000	0.7553	1.0000

The result in Table 1 shows that the correlation coefficients that are diagonal to the table are all equal to 1. This is because each variable is perfectly correlated with itself. The other correlation coefficients that are not equal to 1 show the correlation between the independent and dependent variable.

3.1 Correlation Analysis between Nigerian Content Policy and Subsea Equipment

The correlation coefficient (r) between Nigerian Content policy ($x1$) and fabrication of subsea equipment (y) is r (18) = 0.13, p = 0.596.

The result shows that there is a positive weak strength linear relationship between them. The scatter plot between Nigerian Content policy and the fabrication of subsea equipment is as shown in Figure 1.

The result in Figure 1 shows that there is a positive weak strength linear relationship between the Nigerian Content policy and the fabrication of subsea equipment.
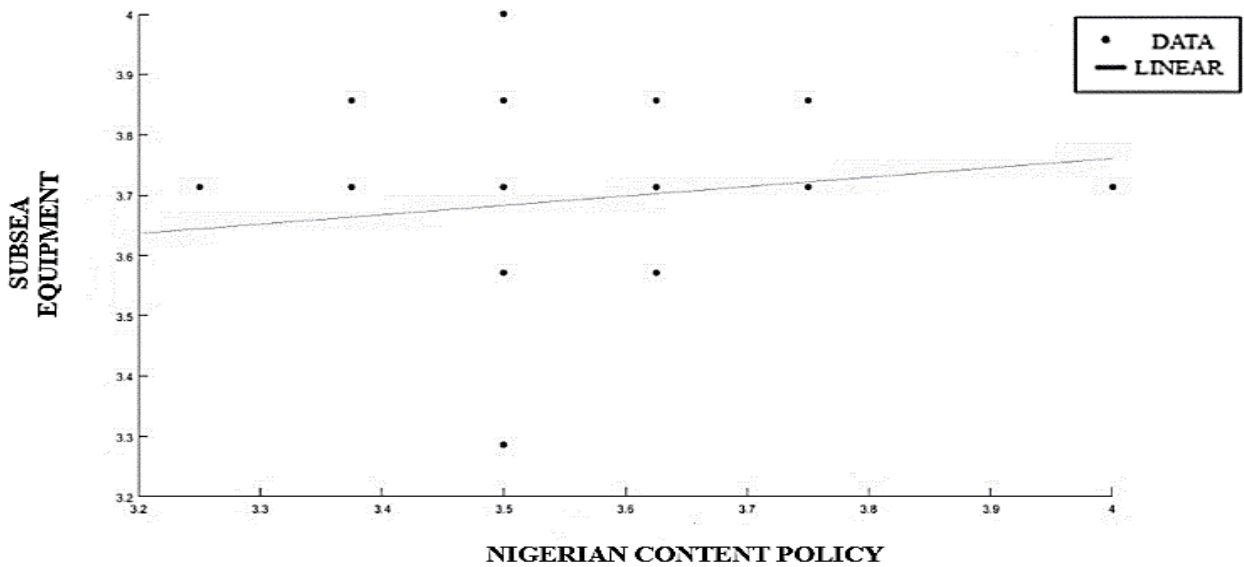

Figure 1: Scatter Plot for Nigerian Content Policy and Subsea Equipment
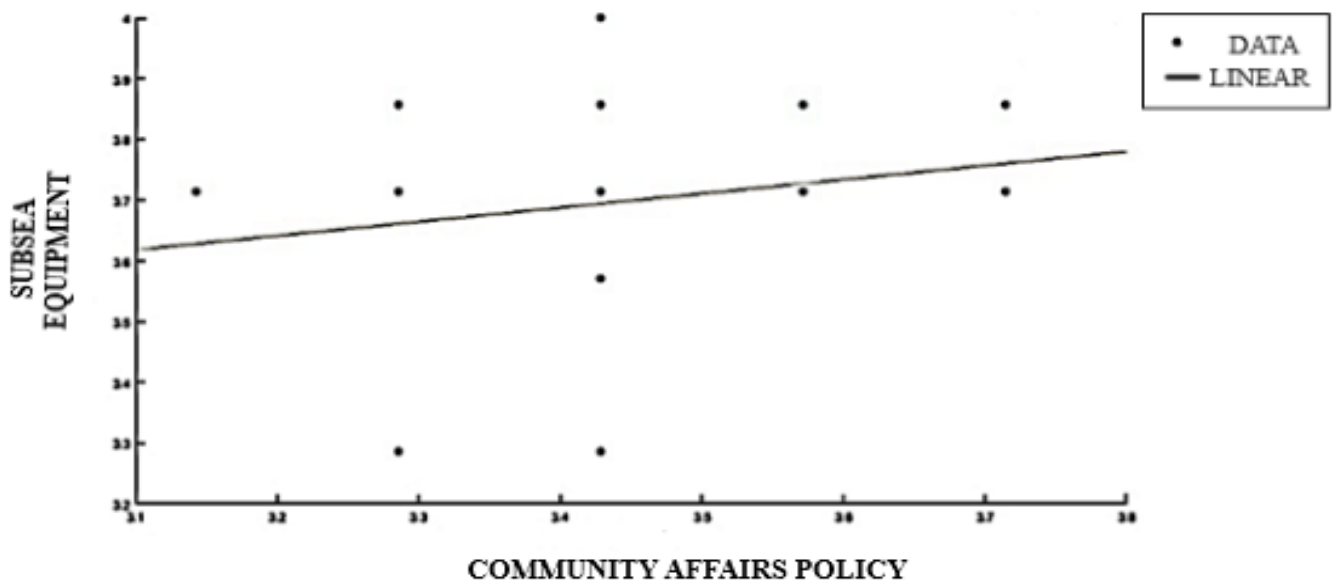

Figure 2: Scatter Plot for Community Affairs Policy and Subsea Equipment

The line of best fit indicates a linear relationship because it is straight. It also rises from left to right which means that the fabrication of subsea equipment (dependent variable on the y-axis) increases as the Nigerian Content policy (independent variable on the x-axis) increases which also indicates a positive correlation. The correlation is weak because the points are not arranged linearly. It has little indication of points falling into a line. The alternative hypothesis (H11) for Nigerian Content policy and the fabrication of subsea equipment is retained while null hypothesis (H01) is rejected. The probability value shows that there is no significant effect of Nigerian Content policy on the fabrication of subsea equipment. The null hypothesis (H02) is retained while the alternative hypothesis (H12) is rejected.

3.2 Correlation Analysis between Community Affairs Policy and Subsea Equipment

The correlation coefficient (r) between Community Affairs policy ($x2$) and the fabrication of subsea equipment (y) is r (18) = 0.17, p = 0.472. This shows that there is a positive weak strength linear relationship between them. The scatter plot between Community Affairs policy and the fabrication of subsea equipment is as shown in Figure 2.

The result in Figure 2 shows that there is a positive weak strength linear relationship between the Community Affairs policy and the fabrication of subsea equipment. The line of best fit indicates a linear relationship because it is straight. It also rises from left to right which means that the fabrication of subsea equipment (dependent variable on the y-axis) increases as the Community Affairs policy (independent variable on the x-axis) increases which also indicates a positive correlation. The correlation is weak because it has little indication of points falling into a line.

The alternative hypothesis (H11) for Community Affairs policy and the fabrication of subsea equipment is retained while null hypothesis (H01) is rejected.

The probability value shows that there is no significant effect of Community Affairs policy on the fabrication of subsea equipment. The null hypothesis (H02) is retained while the alternative hypothesis (H12) is rejected.

3.3 Correlation Analysis between HSE Policy and Subsea Equipment

The correlation coefficient (r) between Health Safety Environment policy ($x3$) and the fabrication of subsea equipment (y) is r (18) = 0.07, p =0.755. This shows that there is a minimal positive weak strength linear relationship or no relationship between them. The scatter plot between Health Safety Environment policy and the fabrication of subsea equipment is as shown in Figure 3. The result in Figure 3 shows that there is a positive weak strength linear relationship which is very close to no relationship between the Health Safety Environment policy and the fabrication of subsea equipment. There is a slight rise of the best fit line from left to right which means that as the fabrication of subsea equipment (dependent variable on the y-axis) increases, there will be a little or no increase in the Health Safety Environment policy (independent variable on the x-axis).

The correlation is weak because it has little indication of points falling into a line and is very close to zero. The null hypothesis (H01) for Health Safety Environment policy and the fabrication of subsea equipment is retained while the alternative hypothesis (H11) is rejected. The probability value shows that there is no significant effect of Health Safety Environment policy on the fabrication of subsea equipment. The null hypothesis (H02) is retained while the alternative hypothesis (H12) is rejected.

3.4 Multiple Regression Analysis

Multiple regression was carried out to investigate the effects of Nigerian Content policy, Community Affairs policy, and Health Safety Environment policy on the fabrication of subsea equipment. The regression was coded in MATLAB and the result obtained is as shown in Table 2 and 3.

Number of observations: 20, Error degrees of freedom: 16, Root Mean Squared Error: 0.211, R-squared: 0.0963, Adjusted R-Squared: -0.0732, F-statistic vs. constant model: 0.568, p-value = 0.644.

The results of the regression in Table 4.2 and Table 4.3 indicated that the three predictors (independent variables) explained 9.63% of the variance ($R2 = 0.10$, $F(3,16) = 0.568$, $p = 0.644$).

It was found that Nigerian Content policy non-significantly predicted the fabrication of subsea equipment ($b1 = 0.367$, $p = 0.30$), as did Community Affairs policy ($b2 = 0.384$, $p = 0.30$), and Health Safety Environment policy ($b3 = 0.138$, $p = 0.59$). This result shows that the management policies have no effect on the fabrication of subsea equipment. The null hypothesis (H02) is retained while the alternative hypothesis (H12) is rejected.
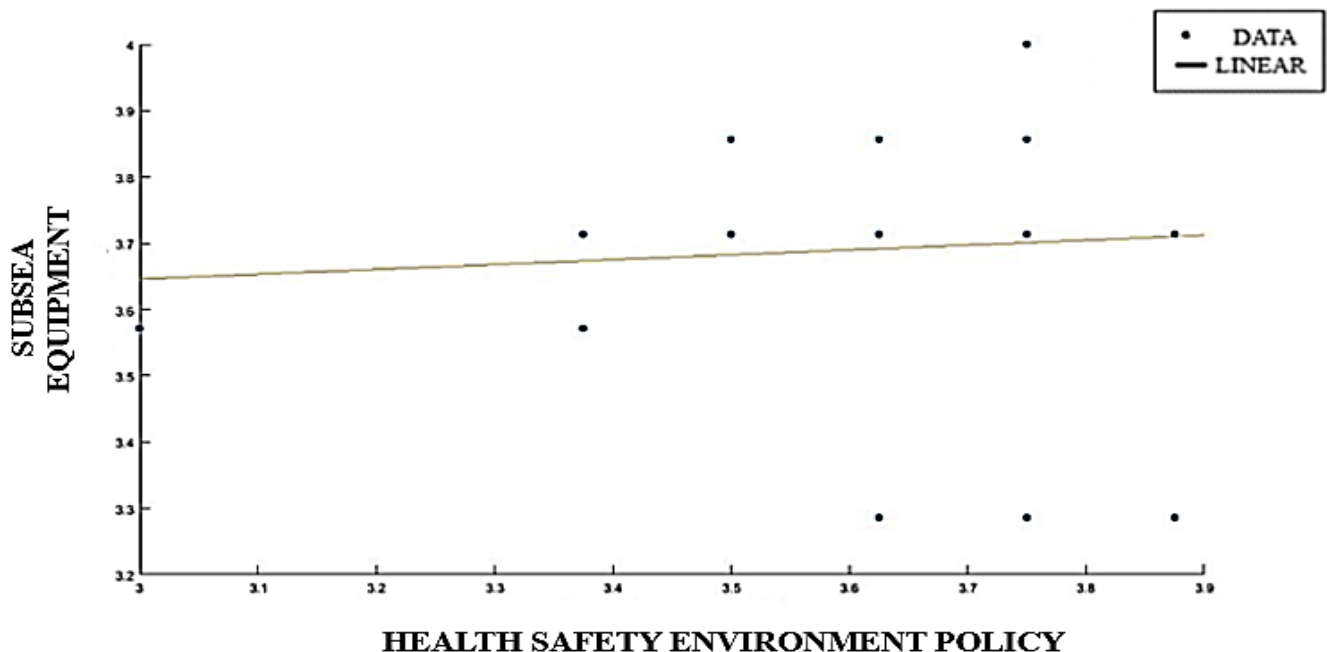

Figure 3: Scatter Plot for Health Safety Environment Policy and Subsea Equipment

Table 2: Regression Model

	Estimate	Standard Error	Test Statistics	PValue	Confidence Interval Lower	Confidence Interval Upper
(Intercept)	0.56944	2.4233	0.23498	0.8172	-4.5678	5.7067
x1	0.36708	0.34419	1.0665	0.30202	-0.3626	1.0967
x2	0.38418	0.35844	1.0718	0.29971	-0.3757	1.1440
x3	0.13776	0.24899	0.55327	0.58772	-0.3901	0.6656

Table 3:   Analysis of Variance Result

	Sum of Squares	Degrees of Freedom	Mean Square	F-Statistics	P Value
Total	0.78587	19	0.041361		
Model	0.075648	3	0.025216	0.56807	0.644
Residual	0.71022	16	0.044389		
Lack of fit	0.42479	13	0.032676	0.34344	0.9255
Pure error	0.28543	3	0.095143		

It may be that there is no link or real effect (or a negligible effect) at the population level between these management policies and the fabrication of subsea equipment, or it may be that there is an association but the present study's design was not sensitive enough to identify the association due to a variety of potential factors such as small sample size, mistakes made during the collection or encoding of the data and measurement error which mask otherwise significant results.

The final predictive model was: fabrication of subsea equipment (y) = 0.56944 + 0.367(Nigerian Content policy) + 0.384(Community Affairs policy) + 0.138(Health Safety Environment policy).

4.   CONCLUSION

The aim of this study was to determine the management policies that can affect the fabrication of subsea equipment using multiple regression analysis, and the objective was to determine the relationship between the management policies and the fabrication of subsea equipment. The set objectives and the aim of the study have been achieved as presented below.

The first objective was to determine the relationship between Nigerian Content policy and the fabrication process of subsea equipment. It could be concluded that there was a positive linear relationship between them though weak in strength, using correlation analysis, and Nigerian Content policy non-significantly predicted the fabrication of subsea equipment using multiple regression analysis.

The second objective was to determine the relationship between Community Affairs policy and the fabrication process of subsea equipment. It could be concluded that there was a positive linear relationship between them though weak in strength, using correlation analysis, and Community Affairs policy non-significantly predicted the fabrication of subsea equipment using multiple regression analysis.

The third objective was to determine the relationship between Health Safety Environment policy and the fabrication process of subsea equipment. It could be concluded that there was minimal positive weak strength linear relationship or no relationship between them using correlation analysis, and Health Safety Environment policy non-significantly predicted the fabrication of subsea equipment using multiple regression analysis.

From the detailed analysis carried out, it is recommended that:

  i.   Similar research be conducted with a large sample size as it will improve the accuracy of the model.
  ii.   Further study be conducted to fully understand the problem of corruption and inaction of the Nigerian government as regards the constant agitations of host communities against the oil and gas fabrication companies.

This research has shown that there is a relationship between management policies and the fabrication of subsea equipment in an oil and

gas fabrication company with little or no effects on fabrication of subsea equipment.

5. ACKNOWLEDGEMENTS

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