

Teamwork and Employee Performance in The bonny Nigeria Liquefied Natural Gas Plant

Dr. Mba Okechukwu Agwu¹

Abstract

The paper discussed teamwork and employee performance in the bonny Nigeria liquefied natural gas plant. It views teamwork as work groups with a common purpose for the achievement of specific goals/tasks. It assumes that teamwork can expand the output of individual employees' through collaboration. The research question addressed the extent of the relationship between teamwork and employee performance (increased employee motivation/commitment and productivity) in the bonny NLNG plant. The place of study is the bonny NLNG plant while the duration of study is between September, 2014 and August, 2015. A descriptive research design was used in executing the study, using 370 randomly selected NLNG plant operators for questionnaire administration. The sample size of 370 was determined from a population of 4,895 plant operators using Yamane 1964 sample size determination formula at 5% level of significance for sampling error. Data collected were analyzed using descriptive and inferential statistics. Results from the data analysis indicated that significant relationship exists between teamwork and employee performance in the bonny NLNG plant thus recommends: sustenance of current team building efforts, regular appraisal of employees' job skill requirements, and regular staff training/development and regular improvement of employees' condition of service.

Keywords: Teamwork, Teams, Employee performance, NLNG plant, Bonny.

Introduction

¹ Dr. Mba Okechukwu Agwu, Department of Business Administration, Faculty of Management Sciences, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria. Tel: 234-803-793-6191. E-mail: mbaagwu38@yahoo.com

1.1 Background of the Study

The bonny Nigeria liquefied natural gas plant, was established for the purpose of processing associated/non-associated gas into liquefied natural gas (LNG) and natural gas liquids (NGLs) for export. The gas processing activities are functionally organized and performed by a series of interrelated work teams. Teamwork has emerged in recent years as one of the most important ways of organizing work (Osterman, 1994 and Waterson *et al.* 1997). Teamwork is viewed as work group with a common purpose for the achievement of goals/tasks (Harris and Harris, 1996). It implies that individuals work in a co-operative environment in the interest of a common goal by sharing knowledge, skills and being flexible enough to serve multiple roles. Hence, emerging work culture features more autonomy and control by workers for greater involvement in the enterprise (Harris and Harris, 1989).

Teamwork is a means of improving manpower utilization and potentially raising performance of not just the individual but the organization ultimately, because it can expand the output of individuals through collaboration. Thus, employees who work in teams become the standard for the organization (Alie, Bean and Carey, 1998). With support from top management, employees work confidently in teams to increase organizational productivity. Nowadays, managers are assigning more team projects to employees with opportunities to strengthen their knowledge and develop their skills (Hartenian, 2003). Teamwork has the potential of improving the performance of individual employees and the organization, though it needs to be nurtured over time (Ingram, 2000).

A work group is a group of employees that interact with each other primarily to share information and make decisions that assist individual members in carrying out their duties while a work team is a group of employees whose individual efforts result in a performance that is greater than the sum of their individual inputs (Robbins and Judge, 2007). Teamwork helps employees to cooperate, enhance their skills, provide feedback and reduce individual conflicts.

The shift from working alone to working in teams require employees to cooperate, share information, confront differences and sublimate personal interests for the greater good of the team. Teams may then be portrayed as effective work groups whose effectiveness rests on the degree of motivation, co-ordination and purpose and whose synergy produces an energy/creativity which is beyond them as individuals (Spencer and Pruss, 1992). Hence, teams must possess a definable membership, group consciousness, and a sense of shared purpose (Adair, 1988).

Since the commencement of its production activities on February 27, 2000, the bonny NLNG plant, has converted over 92 billion cubic meters or 3.3 trillion

cubic feet of Associated Gas (AG) to export LNG/NGL products (equivalent to over 968 LNG/NGL cargoes) which otherwise would have been flared. Presently, the plant has the capacity to load and safely deliver over 340 cargoes of its products annually. It also delivers about 8% of the world's liquefied natural gas demand, supplies over 70% of Nigeria's liquefied petroleum gas needs and contributes about 7% of Nigeria's gross domestic product (NLNG, 2015). In order to remain competitive in the global natural gas industry and ensure increased employees performance, greater productivity and better problem solving at work, the management of bonny NLNG plant, grouped its workforce into work teams on functional bases to carry out its productive activities. It is against this background that it becomes pertinent to discuss teamwork and employee performance in the bonny NLNG plant.

1.1 Statement of the Problem

The major challenge of teamwork in the bonny NLNG plant is the differences in the level of competence of team members while highly competent team members tries to increase the work pace, the lowly competent ones tries to slow down the work pace. This leads to the over working/stressing of highly competent team members while the less competent ones are relaxing. Also, individual social/cultural differences among team members constitute a challenge to effective teamwork. A Moslem may not be comfortable working with a Christian team member though both may be grouped in the same work team. This situation may lead to lack of cohesion among team members resulting in loss of team productivity. Differences in the employment contract of team members constitute another impediment to effective teamwork. This creates a feeling of inequality among team members resulting in loss of team spirit. The aforementioned inconsistencies among team members may result in loss of organizational productivity, competitive advantage and corporate benchmarking.

1.2 Research Objectives

The objectives of the research are as follows:

1. To determine the extent of the relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant.
2. To determine the extent of the relationship between teamwork and increased employee productivity in the bonny NLNG plant.

1.3 Research Questions

Despite the inconsistencies among team members in the bonny NLNG plant, the various milestones recorded by the plant could not have been possible without teamwork thus prompting the following research questions:

1. Does any significant relationship exist between teamwork and increased employee motivation/commitment in the bonny NLNG plant?
2. Does any significant relationship exist between teamwork and increased employee productivity in the bonny NLNG plant?

1.4 Research Hypotheses

In view of the above research questions, the following null hypotheses were formulated:

1H₀: There is no significant relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant.

2H₀: There is no significant relationship between teamwork and increased employee productivity in the bonny NLNG plant.

1.5 Literature Review

There is a large and growing body of literature that shows a positive linkage between teamwork and employee performance. The emphasis on teamwork reflects the view that organizational market value depends less on tangible resources, but rather on intangible ones, particularly teamwork (Stiles and Kulvisaechana, 2005). Conti and Kleiner (2003) reported that teams offer greater participation, challenges and feelings of accomplishment. Organizations with teams will attract and retain the best people. This in turn will create a high performance organization that is flexible, efficient and most importantly, profitable.

In western society, there is evidence to suggest that superior organizational performance may be directly attributed to effective teamwork (Katzenbach and Smith, 1993, Varney, 1989). Teamwork is an important factor for smooth functioning of an organization. Team members enhance their skills, knowledge and abilities while working in teams (Froebel & Marchington, 2005). Organizations which emphasize more on teams have results in increased employee performance, greater productivity and better problem solving at work (Cohen & Bailey, 1999).

According to Ingram (2000) teamwork is a strategy that has the potential of improving the performance of individuals and organizations, though it needs to be nurtured over time. Organizations need to look at various strategies of improving performance in the light of increasingly competitive environments. Top managers need to have the vision to introduce teamwork within their organizations, the

sensitivity to nourish it and the courage to permit teams to play an important part in decision making. Effective team performance may therefore, be attributed to both effective management and effective internal team processes. Katzenbach and Smith (1992) argue that teams are the essential organizational units for achieving performance results as well as accelerating personal growth.

Writers differ on the choice of individuals or groups for different work tasks. While Schermerhorn et al (1995) contend that teams can help accomplish important and sometimes very complex tasks, the Ringelmann effect warns that people do not work as hard in groups as they do individually (Fielder 1967). Although team-building is often advocated as a desirable strategy, some commentators argue that, under certain circumstances, it may be inappropriate, ineffective or unnecessary. Schein (1988), for example, comments that no definitive answer is yet available to the question of whether problems may be best solved by individuals or groups. He suggests that groups tend to make riskier decisions than individuals, though the process takes longer.

Leavitt (1975) suggests that groups sometimes make better decisions than individuals do, but this depends upon the task selected. Lawler (1986) contends that groups can help organizations gain synergy in the accomplishment of important tasks, especially when no individual 'expert' exists, for complex tasks that can be subdivided and when risk is desirable. Lawler's work implies that certain types of task; complex, 'one-off' or with high potential rewards, may be effectively tackled by work groups.

Building teams is therefore, a potentially rewarding task for management that should be approached with knowledge and sensitivity. Dyer (1987) protests that few organizations put into place systematic team-building processes. This process can only succeed if fully supported by unit managers who are committed to the change. Blake and Mouton (1964) likens the team building process to developing a sports team, in which specialist athletes train in isolation and are expected to come together to work as an effective team.

Team effectiveness was studied by Schultz (1958) who derived the notion of compatibility between the members of a group. He argues that it is possible to predict how well a group will come together by looking at the compatibility of the group members. He suggests that there must be degree of implicit agreement on the degree of closeness within teams concerning the personal feelings of the members of the group. It was, therefore, deemed important to match personality types and balance levels of skill, knowledge and expertise so that potential conflict can be minimized (Brindle, 1992).

Zaltman and Duncan (1977) contend that teams can frustrate the change process by rejecting and resisting changes that do not conform to the groups' norms and culture. This 'parochial' thinking is a feature of cohesive task groups that are

common in hospitality organizations where work is allocated by department. Inter-group rivalry is also important as a means of promoting inter-group unity, but needs to be carefully managed (Staw, 1986). Despite the benefits that may accrue from teamwork, implementing a program of teambuilding is far from easy (Tuckman, 1965). McKenna (1994) reinforces this view by commenting that a mutually supportive environment cannot simply be wished into existence. Kinlaw (1992) suggests that despite the difficulties, 'improved organizational outcomes in areas of satisfied external customers, reputation, competitiveness, market share, profitability, and mission success are created through the many projects of continuous improvement undertaken by teams'.

Team building aimed at increasing employees skills have a direct impact on their attitude i.e. motivation, commitment and satisfaction (Wright et al., 2003). Specifically, a large body of research considers motivation to be a key determinant of employee performance (Hardre, 2003). Employees' attitudes and behaviours generally depend on the teamwork approach the organization is using. Lee and Bruvold (2003) stated that teamwork is positively associated with employee productivity; reduced staff intention to leave and organizational effectiveness.

Campbell (1990) in his job performance theory stated that employees' attitudes influence their behaviour which in turn influences organizational performance. It has been argued that employees' turnover is heavily influenced by job satisfaction, motivation and organizational commitment, because no employee would like to stay with an organization that is not satisfied with his work (Chiu & Francesco, 2003). Although, it is argued that satisfaction usually precedes organizational motivation and commitment, it is suggested that job satisfaction and organizational motivation and commitment are strongly interrelated (Bartlett, 2001). Rowden and Conine (2003) observed that a large part of the workers sense of job satisfaction can be attributed to workplace learning opportunities via teamwork.

1.6 Conceptual Framework

Teamwork is an umbrella term that depicts the degree of co-operation which exists in teams or between teams. Team working is a complex activity that needs an appropriate framework for analysis. Its multidimensionality makes it difficult to be captured in one approach or theoretical framework. This multidimensionality is emphasized in the integrative model proposed by Hartley (1997) which suggests that teams can be studied at three levels.

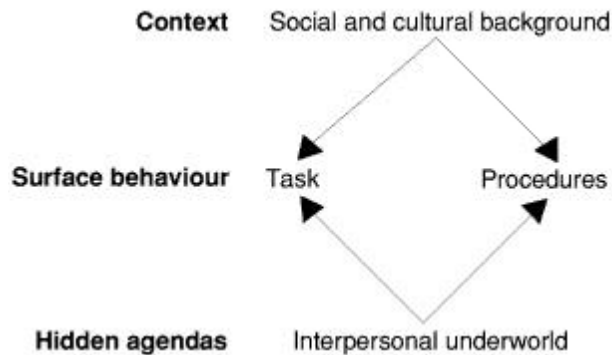


Figure 1. Hartley's integrative model of team working
Source: Hartley (1997)

Hartley's model shown in figure 1 demonstrates some of the overt and covert factors that affect a team's tasks and procedures. Social and cultural background can affect team ideologies and group behaviour in different cultures. Another way of differentiating group behavior is by the degree of demonstrated competitiveness, while the focus of a sports team is to compete with other groups, the focus of a jury team is to reach a satisfactory decision. The complexity of group behaviour is further heightened by the hidden agenda which shapes the pattern of likes, dislikes, resentments and other emotions which exist between group members.

Another way of studying a team is by regarding it as an open system which interacts with its environment in the process of transforming inputs to outputs (Mullins, 1992). Teams may be large or small; a firm, unit, department or small working group of staff or managers. Teams as systems take in resources (time, people, skills, problems) and transform them into outputs such as work, solutions and satisfactions. Teams interact with other teams and are affected by the pressures of the environment including the firm, the economy and the needs of customers.

The approach proposed by Schemerhorn et al. (1995) studied teamwork in a three-stage sequence, in which the vital transformational processes are termed 'throughputs'. The model maps out the criteria by which effective teams may be recognized and identifies those inputs and throughputs which lead to successful outputs.

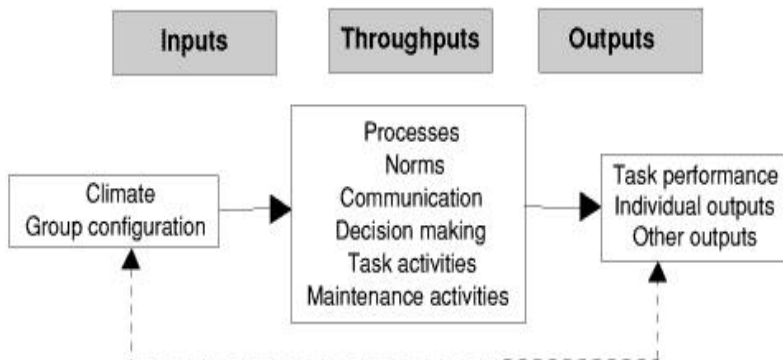


Figure 2: An open systems model of teamwork
Source: Adapted from Schermerhorn et al. (1995)

Inputs are those factors that are controlled or influenced by management and they include climate and group configuration. Management also filters and focuses inputs from the environment through its vision of strategic direction and preferred work practices. Climate refers to the organizational ambience in which teams work or 'shared perceptions of organizational policies, practices and procedures while group configuration encompasses size, membership balance and the blend of talent within the team. Adair (1988) differentiates between atmosphere and climate with the suggestion that atmosphere may be temporary, while climate implies a prevailing condition.

Throughputs refer to the activities and tasks which help to transform inputs to outputs. They may have the greatest influence on effective teamwork as they include team processes, cohesiveness, communication, task activities and maintenance activities. Team processes implies that effective teams share clear and well understood goals which are accepted by their members. Cohesiveness implies co-operation, group oneness, commitment and positive interdependence. Communication must be clear, accurate, honest and open. Decision-making should be conducted according to established procedures which should be known to all. Task activities are those that enable the team to manage itself effectively. Effective teams take responsibility for the work, confront difficult situations and plan well. Maintenance activities enable the team to deal with conflict using productive controversy techniques.

Successful outputs are those outcomes which satisfy organizational or personal goals or which are compared to pre-determined criteria. The success of outputs may be assessed by a number of stakeholders, including the organizations itself and the people within it, shareholders, suppliers and media commentators. Team outputs include the performance of team tasks, individual outputs and other outputs.

The task performance of a team may be judged on a number of criteria, including quality and productivity.

For the organization, successful task performance outputs may result in profit (George, 1987), growth, crisis survival (Greco, 1988) or improved public image (Johnson, 1986). Successful task performance for a team may result in improved commitment, co-operation, creativity and energy. Teams that perform tasks well are able to create more time and reduce schedule delays and cost overruns (Johnson, 1986). Another outcome of successful team performance is personal satisfaction and development of team members. Member satisfaction may be manifested by personal freedom, pride in achievement (Woodcock, 1989), a feeling of contributing to success (Zapp, 1987) or simply of being interested in the work (Thamhain, 1990). Member satisfaction may also result in tangible and less tangible rewards. Tangible rewards and recognition lead to positive reinforcement and a greater likelihood of repeating the desirable behaviour (Miller, 1975). Other less tangible outputs of effective teams include the capacity to face mistakes openly and learn from them (Woodcock, 1989). In summary, it may be suggested that, although team working is a complex and multi-dimensional concept, the systems model encapsulates some of the characteristics and linkages which are present in effective teams.

1.7 Theoretical Framework

This research is based on the HRM-performance linkage model of Becker and Huselid (1998) and Wright et al. (2003) whose core philosophy suggests that teamwork has a direct impact on employee skills and motivation, which are subsequently translated into improved employee/organizational performance. The HRM-performance linkage model is based on the resource-based view (RBV) which states that increasing employees' abilities and motivation, through teamwork will ultimately improve employee/organizational performance (Lopez et al., 2005). The RBV perspective advocates that the potential for competitive advantage of an organization is based on its ability to exploit the inimitable characteristics of its pool of human resources and capabilities.

The basic causal pathway of this HRM -performance linkage model is as stated thus:

Teamwork → Skills → Attitudes → Behaviour → Employee Performance

Considering this causal pathway, the general framework of the model is indirect linkage or hierarchical linkage through the outcomes of skills, attitudes and behaviour between teamwork and employee performance (Black, 2001). Team work activities aimed at providing increased skills to employees has a direct impact on their attitudes: motivation, commitment and satisfaction (Bartlett, 2001).

Employees' attitudes and behaviours generally depend on the HRM policies and procedures the organization is using. Employees' attitudes influence their behaviour which subsequently influence their performance (Wright et al., 2003). It is argued that employee turnover is heavily influenced by job satisfaction, motivation and commitment (Hardre, 2003). It is also argued that satisfaction usually precedes employee motivation and commitment while job satisfaction, employee motivation and commitment are strongly interrelated (Bartlett, 2001).

2. Materials And Methods

The scope of this research is limited to the direct staff, contract staff and seconded staff working at the industrial area of the bonny NLNG plant. It is assumed that responses obtained from the sample respondents would be representative of the opinions of all categories of employees at the plant on their perception of teamwork and employee performance in their company. The duration of study is between September, 2014 and August, 2015. The core aspect of the study is the use of cross sectional survey research design in generating the required primary data.

A sample of 370 randomly selected respondents from a population of 4,895 NLNG employees consisting of 2,430 direct staff, 1,980 contract staff and 485 seconded staff at the industrial area of the plant in Bonny Island was used for questionnaire administration. The sample size of 370 was determined from the population size using Yamane 1964 sample size determination formula at 5% level of significance for sampling error. The sample respondents were selected using shuffling of cards method (without replacement) in which all the names of the three categories of employees' were each separately written on small cards and the name at the topmost of each of the three group of cards was selected each time, the cards were shuffled until all the sample respondents were selected.

Data collected were analyzed using descriptive and inferential statistics. The questionnaire was designed to obtain a fair representation of the opinions of 370 sample respondents (184 direct staff, 149 contract staff and 37 seconded staff) using a four-point Likert type scale. The questionnaire responses of the sample respondents were presented using tables while formulated hypotheses were tested using analysis of variance (ANOVA). A total of 370 copies of the questionnaire were administered, collected and used for the analysis.

2.1 Calculation of Sample Size

The sample size was determined from the population of 4,895 NLNG employees at the industrial area of the plant in Bonny Island using Yamane (1964) formula for sample size determination thus:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= sample size, N= population size, e= level of significance/sample error factor.

$$n = \frac{4,895}{1 + 4,895(0.05)^2} = \frac{4,895}{13.2375} = 369.78 = 370$$

3. Results and Discussions

3.1 Distribution of Responses on Research Questions

Does any significant relationship exist between teamwork and increased employee motivation/commitment in the bonny NLNG plant? Table 1 shows that questions: 1, 2, 3, 4, and 5 with varying mean scores of 3.00, 2.84, 2.78, 2.73 and 3.03 were above the weighted average of 2.5. The table further revealed a grand mean score of 2.88 indicating a strong evidence of the existence of a significant relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant. This conclusion is buttressed by the observation of Bartlett, 2001 that team work activities aimed at providing increased skills to employees has a direct impact on their attitudes: motivation, commitment and satisfaction (Bartlett, 2001). This conclusion is also supported by the observation of Rowden and Conine (2003) that a large part of the workers sense of job satisfaction can be attributed to workplace learning opportunities.

$$\text{Mean Score} = \frac{4n_4 + 3n_3 + 2n_2 + 1n_1}{(n_4 + n_3 + n_2 + n_1)} \dots\dots\dots \text{Equation (1)}$$

Where n1, n2, n3 and n4 are the respective number of responses obtained from each of the four options provided while 1, 2, 3 and 4 respectively represent the weights (SA (4), A (3), D (2) & SD (1) attached to each of the four options.

Table1. Mean responses on the relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant (n=370)

S/No.	Research Questions	SA(4)	A(3)	D(2)	SD(1)	Total Responses	Mean Score
1.	Does the use of teamwork in the bonny NLNG plant motivate employees to put in their best in accomplishing their tasks?	150 600	100 300	90 180	30 30	1110	3.00
2.	Does the use of teamwork in the bonny NLNG plant enhance employees' job satisfaction?	130 520	100 300	90 180	50 50	1050	2.84
3.	Does the use of teamwork in the bonny NLNG plant create a positive employees' job attitude?	120 480	100 300	100 200	50 50	1030	2.78
4.	Does the use of teamwork in the bonny NLNG plant provide employees' with greater intrinsic rewards?	130 520	80 240	90 180	70 70	1010	2.73
5.	Does the use of teamwork in the bonny NLNG plant increase employees' commitment?	160 640	100 300	70 140	40 40	1120	3.03
	Grand Mean						2.88

Source: Field Survey, 2015.

3.1.2 Question number 2

Does any significant relationship exist between teamwork and increased employee productivity in the bonny NLNG plant? Table 2 shows that questions: 6, 7,

8, 9, and 10 with mean scores of 2.70, 2.97, 2.84, 2.68 and 3.00 were above the weighted average of 2.50. The grand mean of 2.84 shows that there is a strong evidence of a significant relationship between teamwork and increased employee productivity in the bonny NLNG plant. This conclusion is buttressed by the observation of Lopez et al., 2005 that increasing employees' abilities and motivation, through teamwork will ultimately improve employee/organizational performance. The conclusion is also supported by Lee and Bruvold (2003) observation that teamwork is positively associated with employee productivity; reduced staff intention to leave and organizational effectiveness.

Table 2: Mean responses on the relationship between teamwork and increased employee productivity in the bonny NLNG plant(n=370)

S/N o.	Research Questions	SA(4)	A (3)	D(2)	SD(1)	Total Responses	Mean Score
6.	Does the use of teamwork in the bonny NLNG plant increase employees' individual output?	120	90	90	70		
		480	270	180	70	1000	2.70
7.	Does the use of teamwork in the bonny NLNG plant increase organizational productivity?	150	100	80	40		
		600	300	160	40	1100	2.97
8.	Does the use of teamwork in the bonny NLNG plant bring about greater flexibility and increased workflow?	130	100	90	50		
		520	300	180	50	1050	2.84
9	Does the use of teamwork in the bonny NLNG plant bring about production efficiency?	110	100	90	70		
		440	300	180	70	990	2.68
10	Does the use of teamwork in the bonny NLNG plant bring about cost effectiveness in production?	160	90	80	40		
		640	270	160	40	1110	3.00
	Grand Mean						2.84

Source: Field Survey, 2015.

3.2 Test of the First Hypothesis

H₀: There is no significant relationship between teamwork and increased

employee motivation/commitment in the bonny NLNG plant.

H₁: There is a significant relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant.

Table 3: Computation of Statistical Variables on the First Hypothesis from table 1

S/No.	Strongly Agree		Agree		Disagree		Strongly Disagree	
	X	X ²	X	X ²	X	X ²	X	X ²
1	150	22500	100	10000	90	8100	30	900
2	130	16900	100	10000	90	8100	50	2500
3	120	14400	100	10000	100	10000	50	2500
4	130	16900	80	6400	90	8100	70	4900
5	160	25600	100	10000	70	4900	40	1600
Totals	690	96300	480	46400	440	39200	240	12400

Source: Survey Data, 2015.

Calculation of total sum of squares (SS_T)

$$\begin{aligned}
 SS_T &= \sum_{i=1}^c \sum_{j=1}^{n_i} (X_{ij} - \bar{X}_i)^2 \\
 \sum X^2 &= 96300 + 46400 + 39200 + 12400 = 194300 \\
 \frac{(\sum X)^2}{N} &= \frac{(690 + 480 + 440 + 240)^2}{20} = 171125 \\
 SS_T &= 194300 - 171125 = 23175 \\
 SS_T &= 23175
 \end{aligned}$$

Calculation of between group sum of squares (SS_B)

$$\begin{aligned}
 SS_B &= \sum_{i=1}^c n_i (\bar{X}_i - \bar{X})^2 \\
 \frac{(\sum X)^2}{n} &= \frac{(690)^2}{5} + \frac{(480)^2}{5} + \frac{(440)^2}{5} + \frac{(240)^2}{5} \\
 &= 95220 + 46080 + 38720 + 11520 = 191540 \\
 \frac{(\sum X)^2}{N} &= \frac{(690 + 480 + 440 + 240)^2}{20} = 171125 \\
 SS_B &= 191540 - 171125 = 20415 \\
 SS_B &= 20415
 \end{aligned}$$

Calculation of within group sum of squares (SS_w)

$$SS_w = \sum_{i=1}^c \sum_{j=1}^{n_i} (X_{ij} - \bar{X})^2 \text{ or } SS_w = SS_T - SS_B$$

$$\begin{aligned}SS_T - SS_B &= 23175 - 20415 = 2760 \\SS_W &= 2760\end{aligned}$$

Calculation degrees of freedom

$$\begin{aligned}SS_T \text{ df} &= N - 1 = 20 - 1 = 19 \\SS_B \text{ df} &= n - 1 = 4 - 1 = 3 \\SS_W \text{ df} &= n - 1 + n - 1 + n - 1 + n - 1 = 4n - 4 = 4(5) - 4 = 20 - 4 = 16\end{aligned}$$

Calculation of Variances

Between group variance (S_B^2) = $\frac{\text{Between group sum of squares (SS}_B\text{)}}{\text{Between group degree of freedom}}$

$$S_B^2 = \frac{\sum_{i=1}^c n_i (\bar{X}_i - \bar{X})^2}{c-1}$$

$$S_B^2 = \frac{20415}{3} = 6805$$

Within group variance (S_W^2) = $\frac{\text{Within group sum of squares (SS}_W\text{)}}{\text{Within group degree of freedom}}$

$$S_W^2 = \frac{\sum_{i=1}^c \sum_{j=1}^{n_i} (X_{ij} - \bar{X}_i)^2}{n-c}$$

$$S_W^2 = \frac{2760}{16} = 172.5$$

$$F\text{-value} = F_{df_1, df_2} = \frac{S_B^2}{S_W^2} = \frac{\text{Between group variance}}{\text{Within group variance}} = \frac{6805}{172.5} = 39.45$$

Table 4 shows that calculated F-Value of 39.45 resulted from the relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant. This calculated F-Value is significant since it is greater than the critical F-Value of 5.29 given 3/16 degree of freedom at 0.01 level of significance. Hence, the null hypothesis is rejected while the alternative is accepted. This shows that there is a significant relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant.

Table 4: Computation of Analysis of Variance on the relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant

Source of variance	Sum of squares	Degree of freedom	Mean sum of squares	Calculated F-value	Table critical F- value	Decision
Between group	20415	3	6805	4.39.45	5.29	Ho: Rejected
Within group	2760	16	172.5			
Total	23175	19				

Source: Statistical Computation and Table 3.

3.3 Test of the Second Hypothesis

H₀: There is no significant relationship between teamwork and increased employee productivity in the bonny NLNG plant.

H₁: There is a significant relationship between teamwork and increased employee productivity in the bonny NLNG plant.

Table 5. Computation of Statistical Variables on the second Hypothesis from table 2

S/No.	Strongly Agree		Agree		Disagree		Strongly Disagree	
	X	X2	X	X2	X	X2	X	X2
6	120	14400	90	8100	90	8100	70	4900
7	150	22500	100	10000	80	6400	40	1600
8	130	16900	100	10000	90	8100	50	2500
9	110	12100	100	10000	90	8100	70	4900
10	160	25600	90	8100	80	6400	40	1600
Totals	670	91500	480	46200	430	37100	270	15500

Source: Survey Data, 2015.

Calculation of total sum of squares (SS_T)

$$SS_T = \sum_{i=1}^c \sum_{j=1}^{n_1} (X_{ij} - \bar{X}_i)^2$$

$$\sum X^2 = 91500 + 46200 + 37100 + 15500 = 190300$$

$$\frac{(\sum X)^2}{N} = \frac{(670+480+430+270)^2}{20} = 171125$$

$$SS_T = 190300 - 171125 = 19175$$

$$SS_T = 19175$$

Calculation of between group sum of squares (SS_B)

$$SS_B = \sum_{i=1}^c n_i (\bar{X} - \bar{\bar{X}})^2$$

$$\frac{(\sum \bar{X})^2}{n} = \frac{(670)^2}{5} + \frac{(480)^2}{5} + \frac{(430)^2}{5} + \frac{(270)^2}{5}$$

$$= 89780 + 46080 + 36980 + 14580 = 187420$$

$$\frac{(\sum \bar{X})^2}{N} = \frac{(670 + 480 + 430 + 270)^2}{20} = 171125$$

$$SS_B = 187420 - 171125 = 16295$$

$$SS_B = 16295$$

Calculation of within group sum of squares (SS_w)

$$SS_w = \sum_{i=1}^c \sum_{j=1}^{n_i} (X_{ij} - \bar{X})^2 \text{ or } SS_w = SS_T - SS_B$$

$$SS_w = SS_T - SS_B = 19175 - 16295 = 2880$$

$$SS_w = 2880$$

Calculation of Degrees of Freedom

$$SS_T \text{ df} = N - 1 = 20 - 1 = 19$$

$$SS_B \text{ df} = c - 1 = 4 - 1 = 3$$

$$SS_w \text{ df} = n - 1 + n - 1 + n - 1 + n - 1 = 4n - 4 = 4(5) - 4 = 20 - 4 = 16$$

Calculation of Variances

Between group variance (S_B²) = $\frac{\text{Between group sum of squares (SS}_B\text{)}}{\text{Between group degree of freedom}}$

$$S_B^2 = \frac{\sum_{i=1}^c n_i (\bar{X}_i - \bar{\bar{X}})^2}{c-1}$$

$$S_B^2 = \frac{16295}{3} = 5431.67$$

Within group variance (S_w²) = $\frac{\text{Within group sum of squares (SS}_w\text{)}}{\text{Within group degree of freedom}}$

$$S_w^2 = \frac{\sum_{i=1}^c \sum_{j=1}^{n_i} (X_{ij} - \bar{X}_i)^2}{n-c}$$

$$S_w^2 = \frac{2880}{16} = 180$$

$$F\text{-value} = F_{df_1, df_2} = \frac{S_B^2}{S_w^2} = \frac{\text{Between group variance}}{\text{Within group variance}} = \frac{5431.67}{180} = 30.18$$

Table 6 shows that calculated F-Value of 30.18 resulted from the relationship between teamwork and increased employee productivity in the bonny NLNG plant. This calculated F-Value is significant since it is greater than the critical F-Value of 5.29 given 3/16 degree of freedom at 0.01 level of significance. Hence, the null hypothesis is rejected while the alternative is accepted. This shows that there is a significant relationship between teamwork and increased employee productivity in the bonny NLNG plant.

Table 6: Computation of Analysis of Variance on the relationship teamwork and increased employee productivity in the bonny NLNG plant

Source of variance	sum of squares	Degree of freedom	Mean sum of squares	Calculate F-value	Table critical F-value	Decision
Between group	16295	3	5431.67	30.18	5.29	Ho: Rejected
Within group	2880	16	180			
Total	19175	19				

Source: Statistical Computation and Table 5

4. Conclusion and Recommendations

The paper discussed teamwork and employee performance in the bonny NLNG plant. It assumes that teamwork can expand the output of individual employees' through collaboration. The three major findings of the research are as follows:

- ❖ The use of teamwork in the bonny NLNG plant brings about greater flexibility and increased workflow.
- ❖ There is a significant relationship between teamwork and increased employee motivation/commitment in the bonny NLNG plant.
- ❖ There is a significant relationship between teamwork and increased employee productivity in the bonny NLNG plant.

Arising from the findings of this paper, it is suggested that the management of bonny NLNG plant should take the following measures to sustain the current gains of its teamwork activities:

1. Sustenance of current team building efforts/incentive scheme: The current team building efforts in the bonny NLNG plant should be improved to

promote cohesion and interdependency in solving operational problems while the incentive scheme should be sustained to maintain high staff morale.

2. Regular appraisal of employees' job skill requirements: There should be regular appraisal of employees' job skill requirements to ensure that every employee possess the relevant skills required in his/her work team.

3. Regular staff training/development: The management of bonny NLNG plant should regularly organize training/development programs to bridge knowledge gaps identified in employees' job/skill requirements.

4. Regular improvement of employees' condition of service: The management of bonny NLNG plant should regularly improve employees' condition of service to ensure high level of staff morale, commitment, efficiency and low staff turnover.

Acknowledgements

The author expresses his gratitude to the management and staff of bonny NLNG plant for their co-operation and support in carrying out this research, especially those that completed and returned the research questionnaire.

Competing interests

The author has declared that no competing interests exist.

References

- Yamane, T. (1964). *Statistics: An Introduction Analysis*. 3rd. ed. New York: Harper and Row Publishers.
- Osterman, P. (1994). How common is work place transformation and who adopts it? *Industrial and Labour Relations Review*, 47(2), 173–188.
- Waterson, P., Clegg, C., Bolden, R., Pepper, K., Warr, P. and Wall, T. (1997). *The Use and Effectiveness of Modern Manufacturing Practices in the United Kingdom*. Sheffield: Institute of Work Psychology.
- Harris, P.R. and Harris, K.G. (1996). "Managing effectively through teams", *Team Performance Management*, 2(3), 23-26.
- Harris, P.R. and Harris, D.L. (1989) "High performance team management", *Leadership and Organization Development Journal*, 10(1), 28-32.
- Alie, R.E., Beam, H., and Carey, T.A. (1998). The use of teams in an undergraduate management program. *Journal of Management Education*, 22(6), 707-19.
- Hartenian, L.S. (2003), Team member acquisition of team knowledge, skills, and abilities. *Journal of Team Performance Management*, 9(2), 23-30.

- Ingram, H. (2000). Linking teamwork with performance. *Journal of Team Performance Management*, 2(4), 5-10.
- Robbins, S.P. & Judge, T.A. (2007). *Organizational behavior*, Twelfth edition. New Jersey: Pearson educational Inc.
- Spencer, J. and Pruss, A. (1992) *Managing Your Team*, Piatkus, London.
- Adair, J. (1988). *The Action-Centered Leader*, The Industrial Society, London.
- NLNG. (2015). Facts and figures on NLNG. Lagos: NLNG public and government affairs Department, 6(1), 35-53.
- Stiles, P. and Kulvisaechana, S. (2005). *Human Capital and Performance: A Literature Review*. Judge Institute of Management, University of Cambridge, UK.
- Conti, B., and Kleiner, B. (2003). How to increase teamwork in organizations. *Journal of Quality*, 5(1), 26-29.
- Katzenbach, J. and Smith, D. (1993). *The Wisdom of Teams: Creating the High Performance Organization*. Cambridge, MA: Harvard Business School Press.
- Varney, G.H. (1989). *Building Productive Teams: An Action Guide and Resource Book*, 1st. edition. Jossey-Bass, San Francisco.
- Froebel, P., and Marchington, M. (2005). Teamwork structures and worker perception: a cross national study in pharmaceuticals, *International Journal of Human Resource Management*, 16(2), 256-276.
- Cohen, S.G., and Bailey, D.E. (1999). What makes teams work: group effectiveness research from the shop floor to the executive suite. *Journal of Management*, 23(3), 239-290.
- Katzenbach, J.R. and Smith, D.R. (1992) "Why teams matter". *The McKinsey Quarterly*, 25(2), 3-27.
- Schermerhorn, J.R., Hunt, J.G. and Osborn, R.N. (1995). *Basic Organizational Behavior*, Wiley, New York.
- Fielder, F.E. (1967). *A Theory of Leadership Effectiveness*, McGraw-Hill, New York.
- Schein, E.H. (1988). *Organizational Psychology*, Prentice-Hall, New Jersey.
- Leavitt, H.J. (1975). "Suppose we took groups seriously?" in Cass, E.L. and Zimmer, F.G. (Editors.) *Man and Work in Society*, Van Nostrand Reinhold, New York.
- Lawler III, E.E. (1986). *High-Involvement Management*, Jossey-Bass, San Francisco.
- Dyer, W.G. (1987). *Team Building: Issues and Alternatives*, 2nd. edition. Addison-Wesley, Reading, MASS.
- Blake, R. and Mouton, J. (1964). *The Managerial Grid*, Gulf, Houston, TX.
- Schultz, W. (1958). *FIRO: A Three Dimensional Theory of Interpersonal Behaviour*, Van Nostrand Reinhold, New York.
- Brindle, L. (1992). "Handing out the Oscars: a new look at team building", *Human Resources*, 23(1), 92-96.
- Zaltman, G. and Duncan, R. (1977). *Strategies for Planned Change*, Wiley, New York
- Staw, B.M. (1986). "Organizational psychology and the pursuit of the happy/productive worker". *California Management Review*, 6(3), 40-53.
- Tuckman, B.W. (1965). "Developmental sequence in small groups". *Psychological Bulletin*, 63(3), 384-399.

- McKenna, S.D. (1994). "A culture instrument: driving organizational learning". *Leadership and Organization Development Journal*, 13(4), 24-29.
- Kinlaw, D.C. (1992). *Continuous Improvement and Measurement for Total Quality: A Team-Based Approach*, Business One Irwin, Homewood, ILL. Wright, P. M., Gardner, T. M., & Moynihan, L. M. (2003). The impact of HR practices on the performance of business units. *Human Resource Management Journal*, 13(5), 21-36.
- Hardre, P. L. (2003). Beyond two decades of motivation: A review of the research and practice in instructional design and human performance technology. *Human Resource Development Review*, 2(1), 54-81.
- Lee, C.H. and Bruvold, N.T. (2003). Creating value for employees' investment in employee development. *Int. J. Hum. Resource. Manage.*, 14(2), 981-1000.
- Campbell, J. (1990). Modeling the performance prediction problem in industrial and organizational psychology. In M. Dunnette, and L. Hough (Eds.), *Handbook of Industrial and Organizational Psychology*. Palo Alto, CA: Consulting Psychologists Press.
- Chiu, R. K., & Francesco, A. M. (2003). Dispositional traits and turnover intention: Examining the mediating role of job satisfaction and affective commitment. *International Journal of Manpower*, 24(3), 284-299.
- Bartlett, K.R. (2001). The relationship between training and organizational commitment: A study in the health care field. *Hum. Resource. Dev. Quart.*, 12(4):335-352.
- Rowden, R.W. and Conine Jr. C.T. (2003). The relationship between workplace learning and job satisfaction in US small commercial banks. *AHRD 2003 Conference Proceeding*, 1(2), 451-466.
- Hartley, P. (1997). *Group Communication*, Routledge, London and New York.
- Mullins, L. (1992). *Hospitality Management: A Human Resources Approach*, Pitman, London.
- George, P. (1987). "Team Building without Tears", *Personnel Journal*, 66(11), 122-129.
- Greco, G. (1988). "Team Score Victories at Work", *Nation's Business*, 76(4), 38-40.
- Johnson, C. (1986). "An outline for team building: Co-operation, collaboration and communication are the ingredients of an effective team", *Training; The Magazine of Human Resources Development*, 23 (1), 48- 51.
- Woodcock, M. (1989). *Team Development Manual*, 2nd. edition, Gower, Brookfield, Vermont.
- Zapp, T. (1987). "How to build a winning team: Here's a refresher course in good old-fashioned teamwork", *Managers Magazine*, 62(6), 7- 11.
- Thamhain, H. (1990). "Managing technologically innovative team efforts towards new product success", *Journal of Product Information Management*, 7(1), 5-18.
- Miller, K.L. (1975). *Principles of Everyday Behaviour*, Brooks/Cole, Monterey.
- Becker, B. E., & Huselid, M. A. (1998). High performance work systems and firm performance: A synthesis of research and managerial implications. In G.R. Ferris (Ed.), *Research in personnel and human resources*. Stamford, CT: JAI

Press.

Lopez, S. P., Peon, J. M. M., & Ordas, C. J. V. (2005). Human resource practices, organizational learning and business performance. *Human Resource Development International*, 8(2), 147-164.

Black, W. C. (2001). Invited reaction: The influence of individual characteristics and the work environment on varying levels of training outcomes. *Human Resource Development Quarterly*, 12(1), 25-31.