

USING TEAMWORK TO IMPACT NUCLEAR RESEARCH: A CASE STUDY OF GHANA ATOMIC ENERGY COMMISSION

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Abstract: The Fukushima nuclear power plant disaster, which occurred in Japan in 2011 re-echoes the fears of many across the globe, regarding the dangers associated with nuclear technologies, following the Chernobyl disaster in 1986. Against this backdrop, the thirst to innovate to reduce, and if possible, completely eliminate inherent dangers in nuclear power plants designs and processes through research and development within the scientific research echelons of the world has never been so urgent and vital. The essence of employing teamwork to achieve these heights were born or re-ignited to provide solutions. In this study, teamwork and its advantages to scientific research institutions like the Ghana Atomic Energy Commission (GAEC) is explored to encourage Management to consider its adoption or otherwise. Available literature point to the favorability of the concept of teamwork in the research endeavors of GAEC. The work further pry's into how a teamwork culture could be built into research organizations and the merits that accrue to such endeavors. The repercussions for not adopting teamwork on research quality and quantity are clearly outlined and discussed. The research process sort to gather scientific research data through primary and secondary sources. Internal and External Assessors grading of teamwork and groupwork papers, and how they point to teamwork superiority. Findings show that current research progression of the Commission is groupwork inclined other than teamwork. The study is significant in adding to knowledge and unravelling how teamwork can be adopted and utilized in a Ghanaian Research Institutional Setting. Teamwork could also help Ghana to realize the dreams of the President of the First Republic, Osagyefo Dr. Kwame Nkrumah and the aspirations of many in the Pan African diaspora.

Keywords: Commission, Groupwork, Impact, Institute, Nuclear, Research, Respondents, Targets, Teamwork, Team.

1. INTRODUCTION

1.1 Background of the Study

“In order to provide the necessary physical facilities, and also to make for the maximum coordination of effort, I am contemplating the creation of a special scientific community where scientists of the Academy from different fields will live and work. The scheme will enable the scientists to share common facilities, and also increase personal communication between scientists working on related problems. I have proposed the name, “Science City” for this scientific community. It will have a main central building to be known as “The Palace of Science” containing a whole range of laboratories and other facilities” [1].

The vision of the late President was bleakly proverbially referring to scientific research based on teamwork, where ideas are shared and implemented collectively to achieve corporate strategic goals. The Ghana Atomic Energy Commission can realize its dreams of becoming the leading nuclear power producer on the African continent, if it begins to equally strive and tread on the path of teaming science research as is being witnessed in developed institutions such as the ARGONNE of the United States of America and the ROSATOM of Russia. Teamwork and team building abilities, teamwork promotion, team skill (person-person interfacing) application, respect for individual team members and necessary assistance and guidance by management is the unfettered golden handcuffs of the profession [2].

Upon evaluation of a number of technical research publications, it is observed that the Commission is cluttered and dominated by “individual” or loosed groupings of researchers. This phenomenon does not conform to modern science research as noted by researchers such as Merton, (1968) and Fox, (1992). Nuclear research must go beyond group work or “individual work” and look at how people in a team can work together as a unit. This will help to further address “individual” research challenges and comprehensively enhance the smooth forward march of the Commission in the industry, with the quest of clinching its corporate mission and vision. Past researches on teams, teamwork and targets are reviewed in this paper to identify the issues that have been addressed and highlight those that need further study. Conclusions are then drawn to highlight the need to look beyond “individual research” and consider environmental factors, as means of using teamwork for improved project delivery performance to the satisfaction of all stakeholders.

1.2 Problem Statement

Numerous researchers, such as Steiner (1966) reports that, combining team members abilities and resources would achieve better performance, than the best of individual members of the same number coming together to execute the same assignment. Again, to quote Robert K. Merton, ‘the social organization of scientific inquiry has greatly changed, with collaboration and research teams the order of the day’ [3, p. 328]. There is the superiority of teams over the best individuals of their equivalent size of numbers of individuals [4]. Groups of sizes between three to five possess superior performance over a group of an equivalent size. and besides, high performing individuals in groups can be equated to high performing individuals. The results also indicate that the groups perform better than their best member would have performed alone [5].

In most professional fields, people begin in their infancy a routine of working hard in a repetitive faction to improve self. The differences between people emerge when one is engaged in repetitive practice or task in a regular consistent manner for a long period of time. This assertion is common among celebrities. Many features formerly thought to indicate special traits of a kind from birth are actually gained through small consistent incremental practice, over long periods of time, yielding phenomenal dividends in the end [6]. Meaning, effort and environmental uniqueness may present the opportunity for effortful individuals to perform extremely well. According to Murray in 1989, in the history of the world’s civilization, recognition of highly exceptional individuals has been realized, that is, in the arts, sports and sciences. Speculations on the causes of such high achievements were linked to innate superiorities and one’s stars. However, the evolution of scientific research has not gotten answers, because it is deemed challenging due to the interactions between environmental factors and genes, during the extended period of development [7].

Research quality and quantity in the Ghana Atomic Energy Commission over a decade have been sluggish and dull – individualization of research has been rife and breath-taking, productivity has been slow and low, research topics that initiate and engineer change to the Commission and the country at large has never been forthcoming. Nonetheless, great heights could be attained, considering the academic backgrounds of researchers at the Commission’s disposal – it then begs to ask the question: is it the research approach (i.e., individual or group) or a screwed system of research administration?

The relevance of research into this issue is premised on how the solution of the problem could pitch the creation of value for taxpayers’ income to the results of research and its impact on the Ghanaian society.

Based on the above debate postured by various studies, the researchers intend to find out how teamwork can improve research quality and quantity in the Commission. To this course, this paper would present a theoretical framework of teamwork research that provides explanations to why teamwork approach to research should be adopted by Management to achieve quality and quantity in output. Nonetheless, the theoretical framework would take into cognizance the research environment of the Commission.

1.3 Purpose of the Study

The motivation for this research is hinged on the milieu of research findings of scholars such as Gadstein, Sundstrom e’tal and O’Connor e’tal [8], [9], [10], [11], attesting to the effectiveness and efficiency of teamwork in improving on productivity and product quality other than individual works in high risk industries. The researchers in this study seek to examine the probable applicability of the findings of these works in the research environment of the Ghana Atomic Energy Commission. The research findings could be a precursor to revolutionize research approach of the Commission, team-based or group-based.

1.4 Significance of the Study

The outcome of this research can be a catalyst for restructuring research approaches from individual to teamwork to enhance scientific research quality and productivity in the Ghana Atomic Energy Commission.

2. LITERATURE REVIEW

2.1 Theoretical Literature Review

As the African adage verbes: ‘if you want to go quickly then go alone, but if you want to go far go with people or have a companion’. By inference, through teamwork, companies can go far by facilitating the sharing of critical information, skills, ideas and other uncommon, but vital and indispensable resources to achieve the requisite synergy across disciplines or functional areas critical to the creation of new products and/or existing product improvements. The study of how product quality and quantity can be achieved, through teams is therefore vital in explaining how teams impact innovations in business organizations. Considering a myriad of factors pertaining to the nature and virtue of teams is key to creating and maintaining them, and they include:

2.1.1 Team Leadership

In addition, teams consist of different individuals that contribute varied talents to a project. Exploiting the variety within a team is vital, since it provides the grounds for the cross-fertilization of ideas from different environments. This makes results to appear more appealing to a wider audience, because of diversity in teams. Conflicts in teams creates barriers among members, and that affects results, depriving the team of diversity and representation. Understanding one another’s taboos and affections induce cohesion among teams – leaders of teams must be abreast with this noble knowledge and understanding [12].

2.1.2 Team Skills & complexities

Two main skills associated with successful teams involves members executing their assigned roles and sharing information with each and every member of the team. This attitude ensures the accomplishment of set goals. The balance between team membership task execution and timely information relay amongst members is constructive.

A successful team development comes through a progression of stages: forming, storming, norming, and, performing [13], [14]. Two heads are better than one – no wonder teams are noted to perform better than individuals or groups faced with complex and difficult tasks. Teams are usually deployed when situations could lead to severe consequences – this is when the task complexity exceeds the capacity and abilities of an individual. Teams take a variety of forms, from teams of human to teams of robot. As the complexity of the workplace continues to grow, organizations increasingly depend on teams [15].

2.1.3 Empowerment of Teams

Empowerment of teams help to develop members into effective, independent and trustworthy individuals – the strength of a chain is the sum of its weakest link [16]. Team leaders must build and perfect their communication skills to introduce and maintain understanding, thereby establishing trust and good relationships. When individuals in teams are able to build strong relationships that are polar positive, synergy and energy for cross fertilization of effort and ideas are created for performance [16].

2.1.4 Contemporary Science

Robert K. Merton asserts that, collaboration in scientific inquiries is the new playing field, in essence research teams are the order of the day [3]. Over the last few years, the trend has been for scientific research to be increasingly carried out by groups or teams of scientists rather than by individuals.

2.1.5 Targets/Goals

“Productivity can be maximized most effectively if the team first increases its overall team intelligence and positivity. Successful teams become stronger when members learn to communicate with clear understandable and acceptable goals. The leader ‘fits’ the needs of the team, providing the resources needed for renaissance. In other words, teams are instrumental in achieving performance or so to speak, targets; particularly so where management creates the enabling environment for teams to thrive [17].

Ultimate competitive advantage is the product of team achievement that is both potent and so rare. This is the way Patrick Lencioni opened his best-selling book, The Five Dysfunctions of a Team [18]. It has been estimated that nearly all of the Fortune 500 companies employ teams of some form or type in their business [19] and [20]. As organizations grow bigger, they need teams to get better – such organizations are confronted with complex challenges, and that requires the power and capacities of teams to get going. Besides, teams are easier to manage [21].

2.1.6 Team Environment

In today's corporate environment, it appears the team holds the key to business success; therefore, organizations must create a culture that is team tailored to foster team work. However, others still emphasize that there are factors external to the team itself [22] (e.g., a company's culture). The two external team factors include:

- a) Team-Leader Fit – the degree to which the team leader satisfies the needs of the team members.
- b) Team Support from the Organization – the extent to which the leadership of the organization enables the team to perform [15].

Teams are created deliberately to capture the activity of individuals working together. This presents a new, and a more flexible way for companies to carry out inter-dependent tasks. It is about listening to other viewpoints, coordinating actions, and making shared decisions-making based on the assimilation of different perspectives. Teamwork therefore factors affective feeling and cognitive thinking, but not group-think.

However, successful teamwork is pointedly still elusive in numerous organizations. The absence of a particular kind of leadership that fits members aspirations and expectations plays a key role in successful teams [23]. Team performance and success depends not only on the competence of the team itself, in managing and executing responsibilities, but it also depends on the organizational context provided by organizational management [24, pp. 146-161].

2.2 Empirical Literature Review

2.2.1 Team

A team is a group of people who must cooperate with each other to accomplish a given task. It is formed for the purpose of working together with complementary skills through a common approach to achieve what cannot be individually achieved effectively and efficiently [25]. A team therefore has specific objective or recognized goal to attain and requires co-ordinated and cooperative activity among members [26]. A team by its nature offer greater participation, challenges and sense of achievement and therefore attracts and retains people of high capabilities and abilities [27]. Organizational teams have become very useful in accomplishing a wide range of activities including cross-functional projects. Their centrality within the organization however presents two main conflicting goals: long-term renewal and short-term performance [28].

2.2.2 Groups

Groups are a formation of individuals with equal levels of abilities, work is done together and the result become a combined product. Group Work or Collaborative Work is more individualized and not skill-based; interdependence is low and accountability is individual work-based [29]. Groups perform better than the best of an equal number of individuals; but groups of size two (2), perform at the level of the best of two (2) individuals and besides, the best group member is comparable to the best independent individual. Furthermore, groups perform better than their best member would have performed alone [30].

2.2.3 Teamwork

Teamwork is the supportive, inter-reliant and synchronised efforts by individuals working together with the intend of achieving a common objective. This therefore requires the sharing of skills, information, and engaging in multiple roles [31]. Teamwork provides employees the opportunity to lean on each other to learn more about their jobs, through partaking in problem deciphering and decision-making [32]. Teamwork is one of the most widely researched arenas of businesses, which has gained currency in recent times because of its positive impact on productivity and innovation – it however, requires changes in organizational culture and structure to be successful [33]. It bears productivity, quality, innovation and commitment in varied dimensions, positively affecting short- and long-term performance [34].

2.2.4 Why Teamwork is Gaining Currency

According to an article co-authored by Guzzo and Shea in 1992 and a subsequent article by West in 1996, published by the Health Education Authority in the United Kingdom is with the certainty that teamwork is a more effectual way of coming by goods and services. The popularity of teamwork has soared within diverse organisational settings. The growth of organizations' sizes and the complexity that comes with it, as against the effectiveness of teams in such environments have made teams systems adoption and use non-negotiable. Researchers such as Mohrman and others admits the importance of teamwork and offer ten reasons for implementing team-based working in organisations [35]:

- a) Teamwork ensures consistency between organisational environment, strategy and design [36].
- b) Teams aid rapid organizational growth, and they deliver services cost effectively and efficiently, while product or service quality is not compromised.
- c) Teams promote organisational learning more effectively [37].
- d) Cross-functional teams encourage improved quality of products and services [38].
- e) Cross-functional teams can undertake effective process re-engineering [39].
- f) Myer in 1993 emphasizes that time is saved, if activities formerly performed sequentially by individuals, can be accomplished simultaneously by people working in teams.
- g) Innovation is promoted within team-based organisations because of cross-fertilisation of ideas [37].
- h) Flat organisations can be monitored, co-ordinated and directed more effectively if the functional unit is the team rather than the individual [40].
- i) the complexities in the growth of organisations goes hand-in-hand with their information processing requirements, and teams are the answer, not individuals or groups [41].
- j) Guzzo and Shea in 1992 had their findings confirmed by Weldon and Weingarten in 1993 that teamwork can lead to improved efficacy in the delivery of both quantity and quality of goods or services.

2.2.5 Organizational context

Recent research suggests the broader context within which teams work has an influence on their performance. The organization within which a health care team functions can influence team effectiveness in a variety of powerful ways. Researchers, such as Hackman (1990), [42] and Tannenbaum, Beard and Salas (1992), [43] have suggested that the following are among the contextual factors that influence team effectiveness:

- a) Team and organizational rewards
- b) Team objectives and performance feedback
- c) Training and technical assistance
- d) Physical work conditions
- e) Organizational climate
- f) Inter-team relationships
- g) Contracts and management structures and
- h) Team size

2.2.6 Individual or Department Discipline and Interest

Individual productivity may be affected by personal research motivation, creative abilities, and Intelligent Quotient. The educational background of researchers has been shown to be important in some studies. It is found that, graduates from top schools, with research assistance experiences that are employed in research universities, are more productive than other researchers [44]. Similarly Graduates from Grande Ecoles are more productive [45].

Long & McGinnis in 1981 found in a study of US scientists that the level of productivity conformed with the publication characteristics of the unit: Within 3 to 6 years of obtaining a position, a scientist's level of productivity conforms to the characteristics of the unit, independent of previous productivity. Stankiewicz also found that in Swedish research groups in science and technologies, which are led by young and inexperienced scientists, productivity is lower than in groups where leaders are experienced scientists [46]. An Australian study found that certain kind of departmental context may lead to higher productivity. In academic units that are cooperatively managed, together with a sense of satisfaction rather than alienation from the work environment, the results of the unit is likely to result in higher level of individual productivity [47]. Furthermore, several arguments have been identified and advanced in favor of larger departmental size: Firstly, larger

departments can better facilitate collaborative research groups. Secondly, larger departments are more likely to attract high quality researchers. Thirdly, larger departments have greater number of resources. Besides, other studies have looked at how organizational freedom do influence productivity. While the findings are somewhat mixed, they tend to suggest that higher level of freedom support publication productivity [48].

3. METHODOLOGY

3.1 Study Design

The data set for this study consisted of the entire employees' responses to a survey about how teamwork could impact on research quality and quantity in the Ghana Atomic Energy Commission. Data gathered in the process were both quantitatively and qualitatively analyzed.

To eliminate self-selection biases in data collection, and also capturing the views and opinions of top-level management adequately, the researchers employed stratified simple random sampling technique. This probability sampling approach accorded equal selection opportunities, devoid of overlaps of members of the population sample [49].

Besides, a good design survey was developed and deployed to improve response rates, accurately measuring and reflecting respondents' opinions and behaviors and attitudes. The exercise was in-person, to enable researchers to draw first-hand information from respondents [49]. The questionnaires were designed to extract or gather data from respondents regarding their views and understanding of teamwork and the degree to which they have been involved or engaged in groupwork or teamwork. The questionnaire went further to solicit participants experience with groups or teams or both, and the impact such encounters had on their work and person. The survey probed into suggestions or propositions on the best possible solutions that could offer an established teamwork framework for the GAEC.

3.2 Target Population & Sample Size

Respondents randomly contacted for the purpose of the survey were eighty-five (85): seven (7) top-level Management staff, twelve (12) Supporting staff and fifty-Two (52) Research Scientists of the Ghana Atomic Energy Commission (GAEC). Fourteen (14) respondents, representing 16% of the population, could not avail themselves for the exercise.

3.3 Instrumentation

Questionnaire was the main instrument for gathering respondents' views and judgements. Data was analyzed both qualitatively and quantitatively, using Microsoft Excel application. In addition, some secondary data (i.e., Assessed Refereed Journal Papers, Edited Conference Papers and Technical Reports) of scientific teams as against individuals or groups of scientists regarding scores awarded by Assessors during the assessment of Scientific Paper Publications. The data were gathered and analyzed to ascertain the validity of scientific findings on the 'superiority' of teamwork over group or individual works.

4. FINDINGS AND DISCUSSIONS

4.1 Explanation of the Nature of the Problem in Ghana Atomic Energy Commission

4.1.1 General Understanding of Teamwork

The general understanding of Teamwork was found to be confused with group work by majority of respondents, that is, both Management and Staff alike, in their bid to explain the term team and teamwork. The true meaning of teamwork as defined by this paper was weakly presented; the Scientists and Supporting staff who were the respondents in this study understood teamwork around the spheres of groupwork. Respondents did not understand Teamwork to be the co-operative and coordinated efforts by individuals working together in the interests of their common cause [31], which therefore requires the sharing of skills, leadership, and the playing of multiple roles.

The current state of affairs relating to promotion of scientists to higher positions and ranks are not based on the performance of such individuals in a team - promotion of any kind is in respect to individual performance on the job. This approach permits flexibility at the expense of team productivity and quality. Besides, Scientists and Management alike have been hooked on this system for decades in an environment lacking competitiveness and the absence of stakeholder(s) insistence on performance. Specific goals lead to higher performance than do vague, general 'do your best goals' or than no goals at all [50].

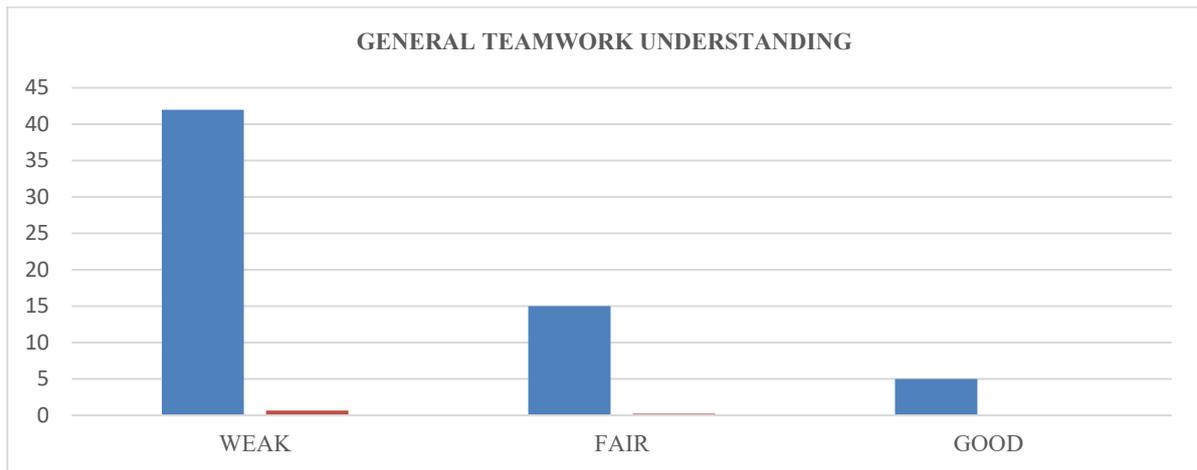


Figure 4.1: GENERAL UNDERSTANDING OF TEAMWORK

The purpose of this study is to find out whether teamwork would be applicable in the GAEC to increase productivity and improve research quality. The researchers therefore set out to verify the general level of understanding of teamwork amongst staff of the Commission. The outcome was not encouraging, for only 8% had a good understanding of the nature and essence of teamwork. About 24% of respondents had a fair idea and 68% had no idea at all - they mistook teamwork to be groupwork. Figure 4.1 and Table 4.1 provides graphical and tabular illustration of the assertions being made.

A very weak understanding of teamwork indicates that, teamwork has not been imbibed formally, as a corporate principle.

4.1.2 Leadership Understanding of Teamwork

Researchers took further steps to find out about the level of understanding of the Management of the Commission, relating to teamwork and groupwork. Seven (7) Directors were approached with questionnaires and the outcome of their responses is tabled and illustrated in Table 4.2 and Figure 4.2 below:

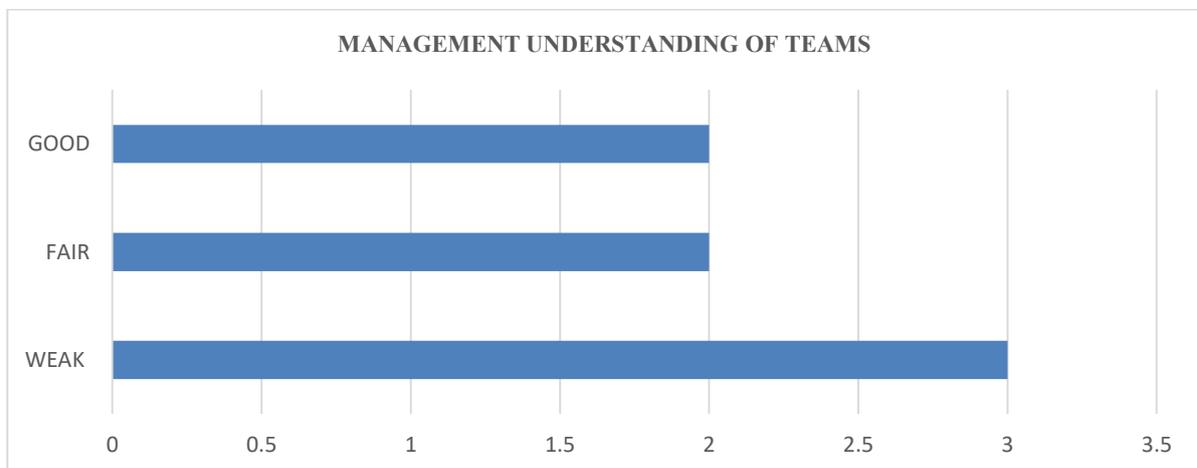


Figure 4.2: MANAGEMENT UNDERSTANDING OF TEAMWORK

Management understanding was tested and grouped on a scale of: Good (28.5%), Fair (28.5%) and Weak (42.9%). Management understanding was found to be a little bit superior to the general understanding of teamwork amongst workers, although it could not be equated to the expectations nurtured amongst the researchers. The general indication is that teamwork has not maybe occurred to them for consideration and formalization. Besides, it was deduced that the mode of research is flexible. It goes to buttress the finding that higher level of freedom support publication productivity [48]. Research quality is what could miss out, but as the saying goes, there is some quality in quantity.

4.1.3 'Individual' or Group Research

With few exceptions, GAEC has not emphasized an integrated approach to its scientific research, such that the whole is greater than the sum of its parts. Research directions and projects have been guided not by an overarching vision of intended impact or clear mission, goals, and strategies, using teams as simple support medium for adding value and bringing change

that provides astronomical growth in organizational research. Instead, research is largely ‘individuals’ or group based. ‘Individual’ or group scientists do high-quality research, but their works are not well coordinated across disciplines and too often, it is not synthesized or made available in a way that others can easily use. Research domains are strictly defined, resulting in the establishment of seven (7) Institutes.

GAEC can develop into a research entity that integrates its expertise and resources that spans differentiated disciplines and organizational boundaries, such that it can bring critical mass to bear on understanding the world of nuclear science research and its application to today’s challenges. The array of Institutes indicates diverse human resource backgrounds and capabilities, which could serve as fertile grounds for teams’ creation, integration and collaboration across disciplines.

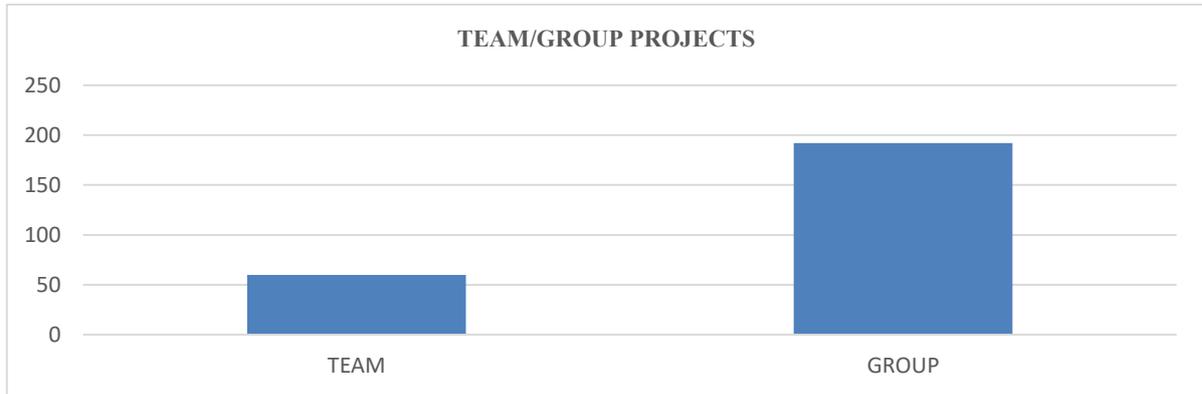


Figure 4.3: TEAMS AND GROUP RESEARCH WORKS UNDERTAKEN (5YRS)

The researchers uncovered that, although teamwork understanding was weak amongst respondents, a sizeable number of scientists had actually been engaged in teamwork projects (23.8%), however a greater majority of those works were with international bodies, such as the IAEA and ROSATOM. The in-house projects, some scientists loosely collaborated with national institutions and were involved in 192 group projects, representing 76.2% within a 5-year period (i.e., 252 projects for the 5-year period amongst research fellows). The finding, as illustrated in Table 4.2 and Figure 4.2 is an indication of how rife groupwork has been over the years in the research culture of the Ghana Atomic Energy Commission. The responsibility therefore, rests with Management who seeks increase in quality and productivity to design a system that will make employees work in the most advantageous ways to achieve organizational objectives [51, pp. 154-196]. Playing advantageous roles is adding realm to productivity.

4.1.4 Research Quality

In researchers bid to appreciate research quality in the Ghana Atomic Energy Commission, assessed publication marks were tabulated and averaged based on teams and groups. The average score of teams and groups observed are tabulated in **Table 4.4** and so illustrated graphically in Figure 4.4.

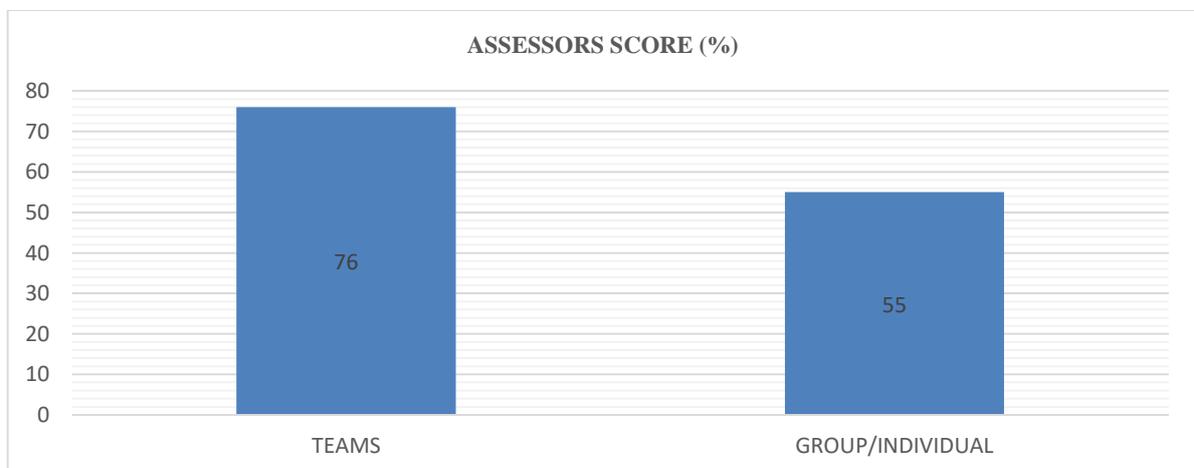


Figure 4.4: SCORES AWARDED BY ASSESSORS

Teamwork bears productivity, quality, innovation and commitment in varied dimensions, positively affecting short- and long-term performance [34]. In order to confirm or disprove findings of Golestani and Others in the Commission's environmental setting, the data collected (marks awarded by Assessors of research work of teams and groups) during and after questionnaire administration, collation and processing, indicated that Assessors awarded higher marks to teamwork publications (i.e., 76%) than groupwork and individual publications (i.e., 55%). Six publications on each side, on teams and groups, were considered in this exercise and marks averages were computed to arrive at the 76% and 55% percentage points [52]. Figure 4.3 and Table 4.3 illustrates the outcome. This implies that quality of work was bent toward teamwork.

4.1.5 Causes of the problem

Respondents went further to state the following, as the underlying causes of GAECs inclination to 'individual' or group research work:

- a) Management apathy toward performance and continual improvement for the reason that the public sector is not so exposed to competitive environments and the pressures of meeting targets within specified timelines and work quality are basically non-existent.
- b) Lack of understanding of the benefits of teamwork, they said could be the reason for the apathy toward teamwork philosophy.
- c) Self-interest instead of corporate interest, meaning Management and scientists do not bother because they will get rewarded anyway (i.e., promoted and compensated). Why should you run if you can crawl to get what someone will run a marathon for?
- d) Microscopic nature of government support for research (less than 0.50% of annual budget) does not actually give it the moral right to subpoena research institutions to account for their stewardship of government kitty expended or invested in their enterprise.
- e) Flexibility in choice, timeline.

4.2 Solution Provided for the Problem

4.2.1 Understanding of Teamwork

The task of beginning to understand understanding is not to be undertaken lightly; it is a task to be attempted and not to be achieved today or even tomorrow. The task of understanding teamwork and its impact on target achievement is the lot of management. Management itself has to understand the concept of teamwork and carry workers along through training programmes, workshops and forums as well as the utility of team blogging platforms engineered and manned by GAEC or other common platforms such as Microsoft SharePoint Services.

In furtherance of this drive, the Commission can also employ the following mediums and avenues to enable the idea to sink down:

- a) Introduce paraphernalia with teamwork inscriptions that wets appetite for inquisitions into teamwork by staff.
- b) Start a Blog: A free blog on Wordpress or BlogSpot to share perspectives and understandings on team issues.
- c) Be an example: Being a good example is always an excellent way to persuade somebody to your way of thinking. People usually follow leaders because leaders possess qualities that they themselves admire. Be the change that you want to see, and others will follow suit.
- d) Let the staff understand the essence of teamwork to increased productivity and its impact on individual team member's development and its ancillary employability opportunities it holds for people with team skills in the job market. Staffs will then esteem the team philosophy, nurture it and apply it at work to contribute to the growth of the Commission.

4.2.2 Convert 'Individual' or Groups into Teams:

Teamwork approach to research is targeted at an object (destination), the destination and the process of reaching the and the destination itself must be shared by all team members to get it right. To convert groups to teams, consider the following strategies:

4.2.2.1 Create a Shared Vision and Common goals:

Creating a shared vision and common goals within teams involves:

- a) Record individual perception of group's common goals,
- b) Consider differences in perception,
- c) Display individual perceptions noted to team members,
- d) Work it out team members the differing perception,
- e) Observe which goals and visions members are passionate about, the level of passion about goals greatly determines their achievability,
- f) Set roles to individuals, with shared goals in mind, and
- g) Ask individuals express the roles they would individually have to play before the shared goal(s) are achieved as a team. Besides, set both a 'benchmark' (the acceptable minimum) goal and a 'stretch' goal (the maximalist goals).

4.2.2.2 Value and Harnessing Diversity

The diversity of people on a team can be both an asset or liability. Understanding diversity therefore is the most valuable asset of a team. This helps members to manage it to their advantage. The team management profile designed by Charles Margerison and Dick McCann is essential in this regard. This leads to the study and understanding of different work styles within teams – understanding these details about team mates reduces the incidence of conflict.

4.2.2.3 Foster Effective Communication

Effective communication in teamwork is a dialogue and not a monologue – we need to listen to our colleagues and subordinates, as much as we would like them to be aligned with corporate goals and vision. Therefore, as a team lead, practise the following tactics:

- a) Formulating a survey of satisfaction ratings in a team setting, pertaining to unique or varied approaches as to the form and focus of dialogue, deemed as the most effective.
- b) support rewording as a tactic to improve engagement in communication.
- c) Conclude your conversations with a question.

4.2.3 Commitment to Targets (Obstacles to Teamwork)

The setting of targets for teams and the provision of the necessary resources and the enabling environment will sway apathy on the part of leadership and staffs alike. As noted in discursive philosophies brought to the fore in this study, work forces perform when targets are set and even better when they are challenging [53].

Promotion to higher ranks should be evaluated and assessed based on team membership and the level of one's performance in contributing to team output.

4.2.4 Leadership must set the tone at the top

Management must be ethical, communicate clearly, making plain management expectations of employees and its intolerance against dishonest and unproductive behavior. The provision of democratic style of leadership where teams are key participants in decision making is paramount; propping up team ego to succeed in achieving targets through teamwork. This is done to make teams take ownership of the goals or targets they set for themselves (indicating 'benchmark' and 'stretch goals').

4.2.5 Measures to reduce Group research by Management

The code of conduct and/or corporate policy should be formulated and continuously developed to echo and serve as a standards and guide to sound decision-making in the work space. The code of conduct or policy might include such topics as: ethics, confidentiality, conflicts of interest, intellectual property, sexual threats, swindle and the requirement to belong to a team. Continual development of the code of conduct should be entrusted to team members to create a sense of ownership amongst employees. This invariably encourages the reporting of offenders by members, in the event of a breach, using dedicated channels (e.g., A hotline, anonymous is preferred to avoid fear or retribution).

4.2.6 Manual Adoption

The adoption of this manual being developed specifically for GAEC is the roadmap to considering value-for-money approaches to researching in today's contemporary global village.

4.2.7 Consolidated Teams

Research team consolidation/alliance will be a step in the right direction, in that, it enhances research scientists' performance because of its collaborative nature in promoting cross-fertilization of ideas and shared understanding of projects. Diversity in regional approach to solving problems among scientist due to exposure to varied environmental experiences can greatly enrich research outputs.

4.2.8 Funding

The adoption of teamwork or teaming approach to research as already noted is synonymous to performance (increased productivity) and product quality. Increased productivity is very likely going to attract the attention of both private and government entities to solicit for the services of the Commission. Events of such stature and importance may 'force' to consider investing in research. Besides, government funding, the Commission could also look inward to provide funding through Internally Generated Fund, for key research projects that are central to the achievement of Corporate Strategic Plan goals.

4.3 Contribution of Researchers to Organization

The contribution of this project embarked on by a three-member team of the Ghana Atomic Energy Commission includes:

- a) The creation of awareness for the need of teamwork for increasing research quality and productivity.
- b) The project has dislocated the confusion about teamwork and groupwork.
- c) A problem half shared is a problem half solved. The respondent's willingness and effort in sharing their problems is a step in the right.
- d) The project is a window of opportunity to securing future funding from both private and public sources through the consolidation of research teams in the Commission. Improvement in research quality and quantity will draw industries and governments' attention to make it a reality.

4.4 Lessons Learnt

Researchers' interaction with scientist in their bid to get them respond to questionnaires administration, they showed astounding mark of understanding in the essence of research and its impact in changing the world, and that was educative to us all.

Researchers equally realized that differences in environmental issues such as the hierarchical structure of organizations and the degree of alignment of Management could be key in creating teamworking research institutions.

4.5 Challenges Encountered

4.5.1 Paper Quality

One glaring challenge is producing results that are verifiable by other scholars, whether this means statistically valid scientific experiments or fully annotated arts theses. These sorts of scholarly practices can be difficult to master, even more so when you have the time pressure of other researchers working in similar areas making constant advances. The development of original thought and discovery of new ways of approaching a problem is labor intensive and stressful.

4.5.2 High Propensity to Off-track

The challenge of been on track and not faltering away from the topic we had decided to research into in the context of environments, particularly that of GAEC.

4.5.3 Literature

The choice of literature and the authenticity of it were worrying until we stumbled on the research search engine, Google Scholar.

4.5.4 Limitation in Questionnaire Administration

Overall, we were limited for not been able to administer questionnaire to a majority or all of the staff of the Commission. This was due to limitation of resources such as time and finance.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The picture that emerges is this, that, nuclear research must go beyond group work or “individual work” and look at how people in a team can work together as a unit. This will help to further address “individual” research challenges and comprehensively enhance the smooth forward march of the Commission in the industry, positioning it to clinch its mission and vision.

There are clearly many interacting factors that contribute to research productivity. Research group size or access to resources is just one, which on the evidence available, may not be very important. Explanations of research performance must take into account personal (individual) and structural (environmental factors), and the interaction between them.

Considering the current state of research in the Commission where no team(s) have been set up and tasked to undertake research, it becomes difficult to evaluate the quality of teamwork results as against group work results which is numerous and uncountable. Future research can be conducted to find out whether teamwork is truly a better approach to research than group work, that is, provided the Commission’s Management accepts to formalize teamwork.

5.2 Recommendations

The current GAEC overly group research domination must change if it is to remain competitive and retain national and global recognition. Based on the findings of the study, the following recommendations are believed to be proper for resolving the issues that relate to low research quality and productivity:

5.2.1 Corporate Policy Formulation and Implementation

The Director-General could set in motion a process for increasing teamwork, collaborative and interdisciplinary research at the Commission. This process can thrive on the back of a strategic interdisciplinary research (IDR) initiatives that include addressing complex issues of global impact. Management is on this note honorably entreated to pursue and implement the following recommendations:

5.2.1.1 Under-Secretary for Science (USS)

Appoint an **Under-Secretary for Science** who has deep understanding and experience of teams and teamwork to be responsible for establishing teams and assessing their performance to bring on board, mechanisms of continual improvement. Although the task would be involving, it could project corporate image and enhance research quality and output. Cross organizational research with both national and international entities would attract donor funding to meet overall research expectations.

Task the Under-Secretary for Science with the responsibility for the creation, strengthening and integrating teamwork, collaborative and interdisciplinary research throughout the Commission.

5.2.1.2 Funding

Develop a strategic plan regarding the development, promotion and protection of teaming and interdisciplinary research in the Commission. This shall serve as the roadmap guiding management to reach out to the mission and vision of the Commission.

5.2.1.3 Organizational structure

Changes in organizational structure required to support implementation of the plan, including creation of a central ‘Science City’ and ‘Science Palace’ as Osagyefo prescribed with definition of functions and requisite resources to boost team efforts (e.g., technology, space and people interaction).

5.2.1.4 Implementation of Plan

Unveil steps for implementation of the plan that touches on required changes in science and infrastructure, coupled with a timetable and milestones against which to measure and monitor progress of work. NNRI, BNARI, RPI, SNAS, RAMSRI and GSSTI as institutes of the Commission shall provide a plan of action that details how they will contribute to implementing the plan and accomplishing its goals. A plan that solicits Inputs from the Commission’s science community in defining: directions and priorities for team research, including recommendations on strategic questions and Commission-wide initiatives related to critical contemporary challenges. An assessment of scientific research opportunities in the external environment could be identified and exploited to enhance interdisciplinary research and funding.

5.2.1.5 Committee

A Standing Committee could be set up to take charge of all the activities regarding sustenance of the teamwork programme and its development. Members of the Committee must be scientists with impeccable record in their area of expertise, in addition to possessing myriads of connections in high echelons of the scientific communities across the globe. The head of Human Resource in the Commission should be a member of Standing Committee to take charge in developing a long-term human resources plan that defines the workforce the Commission needs to hire, for sustainable purposes. The human resource plan should cover employees and non-employees, including researchers, technicians, research support personnel, and central and unit-level administrative staff. The human resource head should provide ongoing opportunities for the professional development of researchers. The Human Resource must strengthen the abilities of scientists to engage in teamwork and interdisciplinary research, using a variety of mechanisms, including: conferences, training, internal and external sabbaticals, joint appointments, networking, and access to post-docs.

5.2.1.6 Management Role

Management should have a second look at adopting a teamwork approach to research, that is known to yield higher research quality and productivity. This can be achieved if management itself has vested interest in realizing research revolution by any necessary means. Besides, from the findings of this research, one of the key obstacles to team research in the Commission is disposed understanding of group work or 'individual work' as teamwork. Implying, after the clarification of the bone of contention, scientists are likely to buy into the team philosophy and tap into its immense benefits.

If doubts are entertained about the possible failure of teamwork, then it could be mounted on pilot basis until the truth of these philosophical discussions are established to be true or false.

5.2.1.7 Technology

Lastly, management should introduce online collaboration and social networking software to improve coordination, collaboration and knowledge sharing, using applications such as Google Apps, Google Sites, Microsoft Windows SharePoint Services and IBM Lotus Connections. These facilities support over 100 million business professionals worldwide blogs, project management, online communities etc. This medium will provide messaging and feedback at phenomenal speeds and lowered cost to the commission, and also broaden the mental outlook of participants of the world of science and innovation.

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