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Assessment of the Level of Knowledge of Non-Scientists on Nuclear Technologies and their Applications at the Ghana Atomic Energy Commission

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ABSTRACT

Given the critical role employee's knowledge about an organization's brand play in this ever-changing competitive environment, there is an increasing demand for organizations to find creative ways to engage employees to properly and adequately represent and promote the brand. These enquiries to understand and find creative ways to effectively engage employees and cultivate employees' knowledge of an organization's brand to remain competitive have mostly been focused on transformational leadership style, trade and industries, etc., at the neglect of nuclear science and other scientific fields of endeavours.

Consequently, stakeholders of these scientific institutions such as the Ghana Atomic Energy Commission (GAEC), are not aware and in some cases not well-informed about the exploits of the Commission and for that matter, the benefits stakeholders can derive from its nuclear technologies. Moreover, despite some level of media engagements by the Commission, there are clarion calls for the Commission to promote and publicize its endeavours, nuclear technologies and other related technologies.

Therefore, the purpose of this study is to ascertain the strength of the employee-based brand equity of the Commission, by assessing non-scientists level of knowledge about nuclear technologies and their applications at the Ghana Atomic Energy Commission to determine their ability and suitability to help promote the GAEC brand and its technologies.

To achieve this a quantitative research method was used for the data collection. One hundred and fifty questionnaires were administered in a

survey and a total of 110 questionnaires were successfully retrieved, accounting for 75.8% of the total administered questionnaires.

It was found that GAEC had a blend of communication channels for reaching its staff. Additionally, the Commission undertakes employee engagements on nuclear technologies. Except that the current approach of employee engagements is considered not to be effective. As a result, the overwhelming majority of non-scientific staff lacked knowledge of the Commission's mission statement and corporate values. Besides, more than half of the non-scientific staff had limited information on nuclear technologies of the Commission. Importantly, the findings revealed that the non-scientists were aware of their current predicaments of not having adequate knowledge of the Commission's brand and its nuclear technologies and therefore proffered ways to improve their knowledge of nuclear technologies.

Keywords : Nuclear Technology, Employee Knowledge, non-scientist, Atomic Energy, Nuclear Power Programme.

I. INTRODUCTION

The world today is living in a fiercely competitive society where employee's knowledge about their organization's products and services has become even more critical to the survival and continued growth of an organization than ever before (Tan and Olaore, 2021).

This assertion has been reinforced by Insperity (2021) that the business world is a dynamic place where every bit of knowledge and creativity must be cultivated from employees for an organization to succeed. Thus, employees are not just representatives of organizations but the first port of call in promoting an organization's brand including, its products and services.

Therefore, one of the strategies businesses and organizations are deploying to generate brand awareness and brand recall, and also remain competitive is to leverage employees' knowledge about the organization while positioning them as internal brand ambassadors (Waller, 2021).

Kakroo (2015) defined internal brand ambassadors as employees aware of an organization's products and services. However, it is not enough for employees to be aware of the organization products and services. They must be knowledgeable about these products and services to promote them wherever they find themselves. Therefore, internal brand ambassadors are employees who are knowledgeable about an organization's brand and its services and can communicate the brand to stakeholders.

The latter definition has been affirmed by King, Debra and Funk (2012, p. 269), who introduced the concept of employee brand equity and defined it as "the differential effect that brand knowledge has on an employee's response to internal brand management". In other words, employees who have

the appropriate brand knowledge, are more likely to understand their roles and deliver the expected brand promise (Ambler 2003; Mangold and Miles 2007; King and Grace 2010).

Consequently, Waller (2021) sustains the argument that studies show that content shared by employees generates eight times more engagement than content shared on brand channels. It implies that employees can be powerful influencers, credible sources for advocacy and a reliable channel for information dissemination, once empowered.

Waller (2021) further noted that employees must know what the organization's brand stands for and how to communicate it. Employees must learn to synergize their brand and that of the organization's brand and identify the most relevant platforms and digital tools for information gathering and sharing. Additionally, employees must position their expertise to other internal stakeholders and build brand awareness with external stakeholders.

Another strategic approach adopted by organizations is the creation of an enabling environment that promotes learning and the sharing of knowledge within the organization. Indeed, Garvin (1993) affirms that creating a learning organization to empower employees through continuous improvement programmes is non-negotiable and inevitable.

Senge (1990) defines a learning organization as an organization that facilitates the learning of its members and continuously transforms itself to remain competitive. According to Tan and Olaore (2020), it involves continuous action toward learning, as learning forms the fundamental value to ensure a competitive edge for any organization and gives the organization the capacities needed to stay ahead of the competition. In 2020, Tan and Olaore explained that competition is no longer about resources accumulated by organizations during the era of the knowledge economy, emphasis was placed more on the actual accumulation and the utilization of knowledge within the organization.

Therefore, it is important and beneficial to organizations to create, acquire, transform and use gained knowledge to cope and also stay ahead of their competitors in this rapid and ever-changing business environment (DiBella, 2019 and Senge, 1990).

The Society for Human Resource Management [SHRM] (2021) has noted that organizations have an important role in perpetuating a strong and desirable culture that shares the organization's beliefs and thrive in that culture, developing orientation, training and performance management programs that outline and reinforce the organization's core values and ensuring that employees truly embody these values.

Given the critical role employee's knowledge about an organization's brand play in this ever-change competitive environment, there is an increasing demand for organizations to find creative ways to engage employees. Consequently, some studies have been conducted regarding employees' knowledge from different perspectives. The work of Hult, Nichols, Giunipero and Hurley (2000) examined global organizational learning in the supply chain looking at the low versus high learning study. The study done on employees' knowledge by Alyoubi, Hoque, Alharbi, Alyoubi and Almazmomi (2013) focused on the impact of Knowledge Management on employee work performance with evidence from Saudi Arabia. The work done by Boateng, Dzandu, and Tang (2016) shifted their study's attention to examining the Knowledge sharing among employees in Ghanaian Industries with the role of transformational leadership style and communal organizational culture.

The motivation for this study is based on the fact that the studies discussed above and other studies examined have looked at employee knowledge from different perspectives, these studies also depict limitations to a particular region and industry in general. None has focused its study on employees' knowledge of nuclear technologies, especially from the Ghanaian context. This is a gap this article seeks to fill, giving significant importance to this study.

Furthermore, despite the stakeholder engagements over the years, the Ghana Atomic Energy Commission (GAEC) and the contribution of its nuclear technologies to addressing societal problems in fields of agriculture, health, water resource and environment, among others, are not well-known by Ghanaians.

Owing to these benefits that Ghanaians can derive from nuclear technologies, there have been various clarion calls by some eminent Ghanaians for the promotion of the GAEC brand and its nuclear technologies. This call is palpably evident in the Ghanaian media. For instance, on November 5, 2021, a news story by Iddi Yire of the Ghana News Agency (GNA) with the headline "Dr Kwaku Aning led GAEC Board inaugurated," the Sector Minister for Environment, Science, Technology and Innovation, Hon. Dr. Kwaku Afriyie, in his speech, urged the Governing Board of GAEC to make the GAEC more visible to the populace.

Similarly, on August 13, 2021, Adom online published a news story with the headline "GAEC participates in Open-Day exhibition of 2021 Civil Service Week Celebration," the Chief Director of the Office of the Head of the Civil Service (OHCS), Mr. Bernard Brocke, enjoined the Commission to promote and make known its scientific activities to stakeholders.

It does appear that the Commission is not leveraging on its employee brand equity as one of its communication arsenals to promote the GAEC brand and its scientific activities resulting in poor brand awareness, brand recall and the drive for nuclear technologies.

The study, therefore, attempts to assess non-scientists level of knowledge about nuclear technologies and their applications at the Ghana Atomic Energy Commission to determine their ability and suitability to help promote the GAEC brand and its technologies.

II. OBJECTIVE

The study was to identify challenges affecting employee brand equity among the non-scientists staff at GAEC, and suggest the possible ways of improving employee engagements for effective promotion of the Commission's brand and its technologies. This led to:

- The evaluation of the level of knowledge on nuclear technologies of staff on non-scientists grade at the Ghana Atomic Energy Communication
- Ascertain the effectiveness of employee engagement programmes at the Ghana Atomic Energy Communication
- Assess gaps and opportunities, if any, for improvement in employee engagement programmes for non-scientists at the Ghana Atomic Energy Commission

III.Methodology

The descriptive research design is adopted purposely to obtain information to systematically describe the characteristics, attitudes, opinions, etc. of the phenomenon or situation in the targeted population (McNabb, 2002).

Consequently, a quantitative research method is employed for the study to describe the level of knowledge of non-scientists on nuclear technologies and their applications at the Ghana Atomic Energy

Commission (GAEC). Furthermore, this research method aided in collecting some numerical data for analysis to assist in answering research questions and the stated objectives of the study (Saunders et al, 2007).

A sample of 150 respondents took part in the study using the stratified random sampling technique. The stratified random sampling approach was used because it increases precision with the stratification. Based on a study by Wimmer and Dominick (2011), this approach allows adequate information of a sub sample. This technique ensured that the sample was drawn from a homogenous subset of the population to reduce sampling error.

The stratified random sampling method was used to obtain the required number of respondents from the staff list of non-scientists categorized into three subgroups or strata. This was done based on the employee grades at the level of the Secretariat of Ghana Atomic Energy Commission, including Senior Members, Senior Staff and Junior Staff. This helped to achieve fairness and a balanced representation of the groups from the overall population for the study. Kumekpor (2002:149) opined that "stratification makes it possible to carry out in-depth investigation of specific characteristics of a population, while making a general study of the population as a whole." With the various departments in mind. The study was categorized based on age and gender variation. The gender variation was based on male and female whilst the age variation was based on six strata for adequate representation of staff.

Furthermore, the study employed the google online form, a survey administration software, to collect and assess the level of knowledge of the non-scientific staff on nuclear technologies at GAEC. The google online form for the study consisted of four sections including; demographic information, corporate information, nuclear technologies and employee engagements at GAEC. A total of 110 sample questionnaires were successfully retrieved which formed 75.8% of the total administered questionnaires.

The successful administered questionnaires of the primary data was analysed using Microsoft Excel spreadsheet as a statistical tool. Furthermore, descriptive statistics such as frequency distribution tables, charts, and graphs were employed to critically evaluate the data based on the study objectives.

IV. Results and Discussions

The analysis of the data was done taken into consideration the research objectives. Namely; to evaluate the level of knowledge on nuclear technologies of non-scientists, to ascertain the effectiveness of employee engagement programmes and to Assess gaps and opportunities, if any, for improvement in employee engagement programmes for non-scientists at the Ghana Atomic Energy Commission.

Demographic Information on Non-Scientific Staff

The key demographic characteristics of gender aggregation, grade category (staff level), and the years spent in the Commission are summarized and presented in Table 1. The study shows that, of the total respondents, 65 out of 110 were females which represent 59.1%, while the remaining 45 were males which represent 40.9% of the sample population.

Table 1 : Demographic background of respondents

Variable	Frequency	Percentage (%)
Gender		
Male	45	40.9
Female	65	59.1
Grade		
Senior Member	45	40.9
Senior Staff	40	36.4
Junior Staff	25	22.7

Experience		
<5 Years	45	40.9
6 – 10 Years	15	13.6
11 – 15 Years	40	36.4
16 – 20 Years	5	4.5
>20 Years	5	4.5

Grade Category (Staff Level)

In terms of grade category, that is the staff level, the largest group comprised the senior members with 40.9%; while senior staff categories and junior staff categories form 36.4% and 22.7%, respectively.

Number of years spent in the Commission.

Regarding the number of years spent with the Commission by respondents, the majority of the respondents, representing 40.9% were fairly new in the Commission. More so, of great significance is that more than half of the respondents, representing 90.9%, had spent between one and 15 years in the Commission; an indication that the Commission has a relatively young workforce.

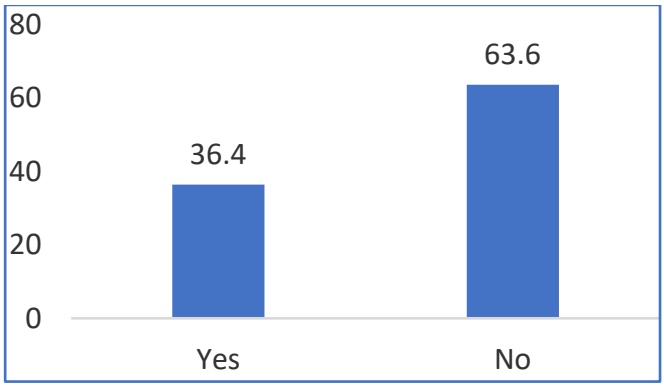

Fig 1: Staff knowledge of the Commission's mission statement

Corporate Information of GAEC

The knowledge of staff on various activities of GAEC was analysed and presented as follows

A. Staff knowledge of the Commission's mission statement

In assessing respondents' knowledge on the mission statement of the Commission, more than half of the respondents, 63.6 per cent answered in the negative to indicate their lack of knowledge of the Commission's mission statement. 36.4 per cent responded in the affirmative. According to Heinilä (2020), it means that majority of non-scientific staff may not have a sense of direction in their day-to-day activities in the Commission. Also, implicitly, there is no clear or defined purpose for the non-scientific staff towards the Commission, no sense of belongingness among them and the likely absence of motivation for them to work harder to achieve success.

B. Veracity of staff knowledge of the Commission's mission statement

In furtherance to the "yes" responses, only 20 (18.2%) out of 40 respondents were able to state the mission of the Commission. The themes that ran through the responses were "peaceful use of nuclear technology" and "advising the government on nuclear matters. The respondents cited the following to illustrate:

"To develop and promote the peaceful utilization of nuclear, biotechnology and other related technologies for socio-economic development through research training and commercialization."

"Advise government on nuclear-related technology and various applications."

Corporate values of GAEC

Regarding respondents' knowledge of the corporate values of the Commission, 65 of them, representing 59.1 per cent, could not state at least two of the values. Out of the remaining 45 respondents (40.9%) who indicated their knowledge of it, 15 respondents (13.6%) stated two of the Commission's values correctly as "Accountability and Integrity". The remaining 30 respondents (27.3%) got it wrong by

stating the vision and mission statements of the Commission instead.

Consequently, more than half of the respondents did not know the values of the Commission. This according to Heinilä (2020) affects the proper shaping of organizational culture and the needed impact for business strategy. It will further ruin the purpose with which the organization was established, impair team spirit, and pull apart that sense of commitment in the workplace.

Heinilä (2020) also stated that the lack of appreciation for an organization's values impair employee communication which plays an important role in building a better organizational culture, improving employee satisfaction, and increasing employee engagement.

Staff knowledge of the Institutes under the Commission

When asked respondents to indicate which of the Institutes is the oldest and the youngest in the Commission, 70 out of the 110 respondents were incorrect, 30 respondents (27.3%) got it right, whereas, 10 of the respondents did not know. Again, this is an indication of poor appreciation of the corporate information of the Commission by the non-scientists.

Nuclear Technologies of GAEC

The study also investigated the knowledge of respondents on the commission's nuclear technologies and related activities and came through with the following findings:

Level of knowledge about applications of nuclear technologies

In assessing respondents' level of knowledge of the Commission's applications of nuclear technologies, 63.6 percent indicated the need for improvement of knowledge in that regard whereas 27.3 percent said they were not satisfied with their level of knowledge about applications of nuclear technologies. Although, five (5) of the respondents (4.5%) said they did not have any knowledge about the applications of nuclear technologies, five (5) of respondents indicated that they were competent in that regard. This suggests that there is need for regular training and capacity of personnel or staff.

Applications of nuclear technologies of GAEC

Respondents were asked to state any three applications of nuclear technologies of GAEC, and 65 respondents (59.1%) itemized Isotope Hydrology for water resource management, Gamma Irradiation for preservation of food, nuclear power for electricity, Sterile Insect Techniques (SIT) for insect/pest control and management and medical radiology for diagnoses and treatment of cancers and other diseases. However, 40 respondents (36.4%) were unable to state a single application of nuclear technologies and 5 respondents (4.5%) stated an application that is not nuclear technology – Tissue Culture – although, it is one of the biotechnologies of the Commission.

Ghana's current phase of Nuclear Power Programme

The study also took interest in how non-scientists at the Commission are abreast with Ghana's Nuclear Power Programme and came through with these findings:

Except for 5 respondents (4.5%) that got it wrong about the current phase of Ghana's Nuclear Power Programme, the majority of respondents (95.5%) got it right by indicating that per the International Atomic Energy Agency (IAEA) Milestone Framework, Ghana is currently on phase two.

Applications of nuclear technologies in agriculture at GAEC

When respondents were asked which applications of nuclear technologies in agriculture at GAEC they knew, 65 respondents (59.1%) wide of the mark stated

biotechnological activities such as tissue culture and soil science, whereas, 45 respondents (40.9) correctly indicated Gamma irradiation and mutation breeding, even though they all left out Sterile Insect Techniques as one of the nuclear applications.

Applications of nuclear technologies in water resources management at GAEC

The majority of the respondents (94.5%) got it right by selecting Isotope Hydrology and the minority of the respondents (4.5%) chose Atomic Absorption Spectrometry as nuclear applications in water resource management at GAEC.

Two main types of Nuclear Reactors

In assessing respondents' knowledge on the types of nuclear reactors, 45 respondents (40.9%) indicated Research and Power Reactors, whereas, the other 45 respondents (40.9%) stated Water and Research Reactors as the two main types with 20 respondents (18.2%) indicating either Research Reactor or Cardon Neutral Reactor. This means that half of the respondents are not fully informed of the two main types of nuclear reactors.

Type of nuclear reactor the Commission uses for its scientific activities

When inquired about the type of nuclear reactor the Commission is using, all respondents (100%) indicated Research Reactor. This suggests that they are well-informed about the type of nuclear reactor the Commission is using for its scientific activities.

Activities of Ghana Space Science and Technology Institute (GSSTI)

On the non-scientists knowledge of activities of GSSTI of the Commission, more than half of the respondents (81.8%) ticked Research and Innovation in Astronomy as one of the activities of GSSTI, although other activities such as radio telescope, remote sensing and satellite instrumentation were left out, whereas, 18.2 per cent of the respondents indicated all of the above, including activities that are not of GSSTI.

Institute responsible for protecting people against radiation sources

On the non-scientists knowledge of the Institute responsible for protecting people from harmful effects of exposure to ionizing and non-ionizing radiation sources, about 90 respondents (81.8%) indicated the Radiation Protection Institute (RPI) of the Commission whereas, 20 respondents (18.2%) said the Radiological Medical Sciences Research Institute (RAMSRI) of the Commission.

Gamma Irradiation Facility (GIF) of GAEC uses gamma irradiation

When asked whether the Gamma Irradiation Facility (GIF) of the Commission uses gamma irradiation processes to decontaminate and/or kill micro-organisms, all the respondents (100%) responded in the affirmative that it is true.

Institution(s) that introduce nuclear education in Ghana

In assessing respondents' knowledge on the institution(s) responsible for the introduction of nuclear education in Ghana, about 30 respondents indicated GAEC, University of Ghana and the IAEA, whereas, 60 respondents said GAEC is the sole institution that introduce nuclear education in Ghana. The reaming 20 respondents (18.2%) said GAEC, University of Development Studies, University of Ghana, KNUST and the Government of Ghana.

Employee Engagements at GAEC

The study also took interest in employee engagements among non-scientists at the Commission and came through with the following findings:

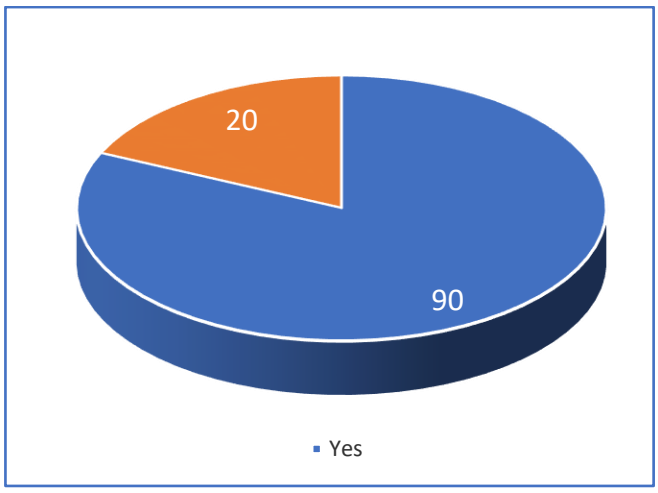

Fig. 2: Sensitization of employees (non-scientists) on nuclear technologies

Sensitization of non-scientists on nuclear technologies at the Commission

When asked if the Commission sensitize employees (non-scientists) on nuclear technologies, about 90 respondents (81.8%) answered in the affirmative to indicate that the Commission ensures non-scientists are informed and educated about nuclear technologies. The remaining 20 respondents (18.2%) responded in the negative.

In furtherance to knowing the form the sensitization takes, the themes that ran through the "yes" responses were "Seminars/Workshops" and "In-service training".

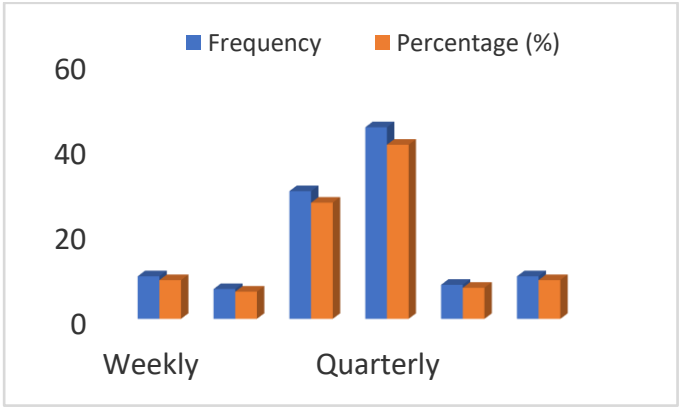

Fig. 3 The employee sensitization

Employee sensitization

On how often is employee sensitization done, about 40.9% of the respondents chose "Quarterly" and 30 respondents (27.3%) said employee sensitization is done "monthly". However, 20 out of the 110 respondents surveyed said employee sensitization is done weekly and annually, whereas, 7 respondents (6.4%) and 8 respondents (7.3%) indicated that the employee sensitization is done fortnightly and biannually, respectively. This finding reveals some level of inconsistency with the regularity at which employee sensitization is done at the Commission.

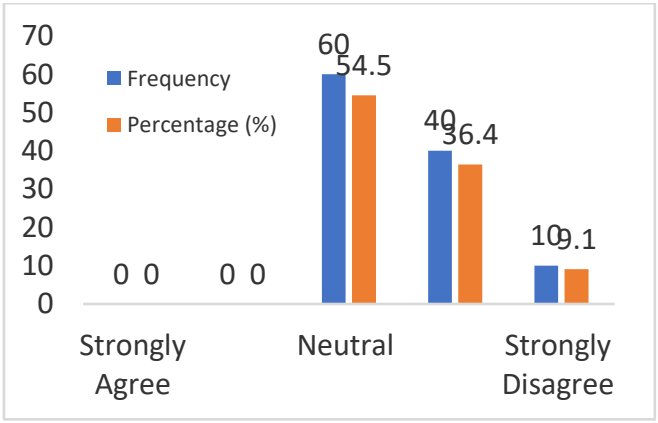

Fig. 4: Employee sensitization of non-scientists knowledge on nuclear technologies

Employee sensitization of non-scientists knowledge on nuclear technologies

Figure 4 above leads credence to the confusion and inconsistency with the regularity at which employee sensitization is done at the Commission where a little over half of the respondents (54.5%) said there were indifferent (neutral) about employee sensitization at GAEC improves non-scientists knowledge about nuclear technologies. 40 out of the 110 respondents noted that they disagree and 10 respondents (9.1%) also indicated that they strongly disagree that employee sensitization at GAEC improves non-scientists knowledge about nuclear technologies.

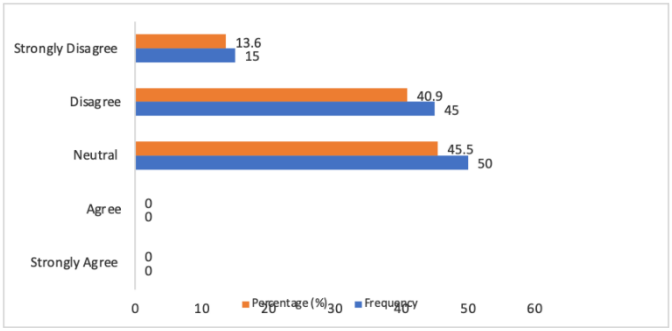

Fig 5: Transfer of knowledge on nuclear technologies from scientists to non-scientists

Transfer of knowledge on nuclear technologies from scientists to non-scientists

Figure 5 above shows that except for half of the respondents who indicated that they were neutral about the transfer of knowledge on nuclear technologies from scientists to non-scientists, 45 respondents said they disagree with the assertion that there is a transfer of knowledge on nuclear technologies from scientists to non-scientists whereas. 15 out of the 110 respondents also stated that they strongly disagree in that regard. This outcome demonstrates the sharing of knowledge within the Commission is somewhat limited or inadequate which would not give the needed confidence or self-assurance for non-scientists to be true internal brand ambassadors of these nuclear technologies and the Commission as a whole.

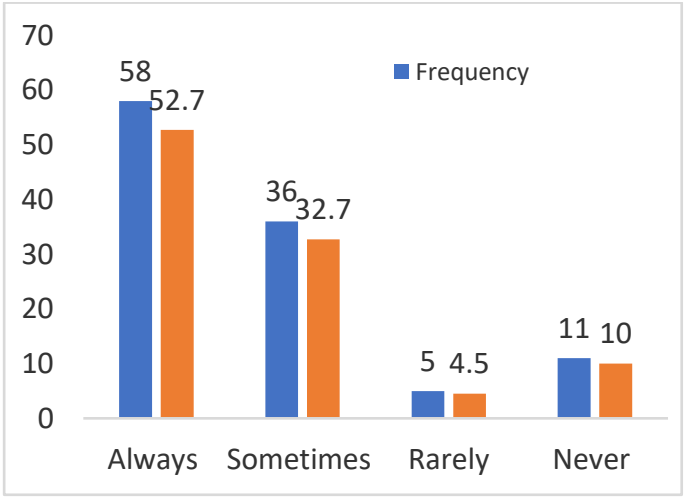

Fig. 6 : Stakeholders Knowledge on GAEC's nuclear technologies

Stakeholders knowledge on GAEC's nuclear technologies

More than half of the respondents (52.7%) chose "sometimes" to share and tell stakeholders about nuclear technologies, whereas, 36 respondents (32.7%) said they "always" do. Eleven (11) out of the 110 respondents chose "never" and the remaining five (5) respondents indicated that they rarely share and tell stakeholders about nuclear technologies.

Channels use for employee engagements about nuclear technologies

In identifying the tools of communication at the Commission, nine (9) communication channels were used by the Commission. Respondents were asked to "tick as many as possible" in finding out if they were aware of the channels used in communicating at the workplace. Of the tools that are used to share information, it was realized that "seminars", "durbars" and "newsletter" (52, 23 and 19 respectively) received the highest response as channels highly used by the Commission to reach out to employees. About 8.2 per cent of respondents confirmed the use of notice boards, social media and Directorate/Centre meetings by Commission while 7 of the respondents attested to the use of circular, intranet and corporate mail. It is evident that respondents had the knowledge and were aware that the Commission used a blend of communication channels in communicating with them on nuclear technologies.

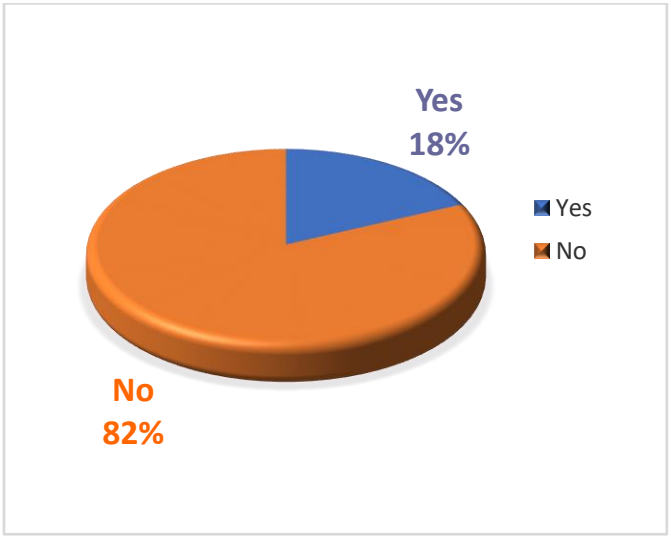

Fig. 7 : Satisfied with current approach to employee sensitization

Satisfied with current approach to employee sensitization for non-scientists

When asked whether respondents are satisfied with the current approach to employee sensitization for the non-scientists, overwhelming majority (81.8%) said no and about 18.2 per cent said “yes”.

Ways to improve employees' (non-scientists) knowledge on nuclear technologies

In finding ways to improve non-scientists knowledge on nuclear technologies, 30 respondents (27.3%) suggested a tailored-made seminars and workshops for non-scientists of the Commission, whereas, another 30 respondents (27.3%) proposed a regular tit-bits via the Commission's social media platforms. The remaining 50 respondents (45.4%) recommended a deliberate effort of regular engagements (face-to-face and focus group discussions) with the scientists to ensure transfer of knowledge from them to the non-scientists. They also noted that as part of the promotional system for the non-scientists, 20% of the marks should allocated for knowledge in that regard. This they noted will encourage the non-scientists to regularly fish for information on nuclear technologies and other related activities of the Commission.

V. Conclusion

The following conclusions are drawn from this study:

- The majority of non-scientific staff lacks knowledge of the Commission's mission statement and corporate values. It means that the non-scientists of the Commission may lack the sense of direction and focus needed to achieve corporate goals and develop plans that will move the Commission forward. This has been emphasized by Heinilä (2020), who intimated that the lack of appreciation for an organization's corporate values and mission statement by employees disintegrates team spirit, mutilates corporate culture, negatively impact business strategy, breeds poor customer service and impairs innovativeness.
- More than half of the non-scientific staff have limited knowledge of nuclear technologies of the Commission. There also exist insufficient transfer of knowledge from scientists to non-scientists. This situation may affect employee confident level to properly and adequately represent an organization and to also promotes its products and services. Therefore, it is important and beneficial for organizations to create, acquire, transform and use gained knowledge to cope and also stay ahead of their competitors in this rapid and ever-changing business environment (DiBella, 2019 and Senge, 1990).
- The results obtained also showed that employee engagements at the Commission are either not effective or low-level engagements. It kills employee morale, decrease productivity and also affect quality stakeholder relations. It has been affirmed by Munavar (2019), who said when the harmony at the workplace is disrupted, an employee's output and productivity can drastically decrease.

The non-scientists are aware of their current predicaments and have proposed ways to improve their knowledge on nuclear technologies. This includes tailored-made seminars and workshops for non-scientists and regular tit-bits via the Commission's social media platforms. The rest are consistent engagements through face-to-face and focus group discussions to ensure the transfer of knowledge from the scientists to the non-scientists, and basic knowledge of nuclear technologies should be made to form part of the non-scientists appraisal/promotional system of the Commission.

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