ICT tools for improving awareness of atomic energy and nuclear technology applications in Tanzanian context

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Abstract

Different ICT tools have been used in different ways to facilitate information dissemination in Tanzania for different purposes but it is not well known how ICT tools can be used to improve awareness on the applications of atomic energy and nuclear technology in Tanzania. The study aimed to identify specific ICT tools and evaluate their effectiveness in enhancing public awareness and understanding of atomic energy and nuclear technology applications in Tanzania. Both quantitative and qualitative methods were used and results have shown that only some people in urban areas and some students would prefer to use ICT tools to improve awareness on the applications of nuclear technology in Tanzania. The t-test showed that there is no significant difference between students and the public in their attitude towards using ICT tools (p>0.05), which means the same or similar ICT tools can be used in both groups. This study can be helpful in guiding the Tanzania Atomic Energy and Nuclear technology agency on which ICT tools can better be used to improve awareness of the applications of atomic energy and nuclear technology in Tanzania and how better they can be implemented.

Keywords: Atomic energy; Awareness; ICT tools; Nuclear technology; Tanzania.

1.0 Introduction

The adoption of Information and Communication Technology (ICT) in developing countries (Kay-isire & Wei, 2016) has in a way helped in the simplification of communication in society (Fred & Na-we, 2017). Different ICT tools have been used in different ways (Adukaite & Cantoni, 2016; Alda-wood et. al., 2019) to facilitate information dissemination in society for different purposes. Both traditional media such as radio and television and advanced media such as the internet and mobile phones are considered very important in ICT (Choudhary & Vyas, 2020). Tanzania has also been using ICT in different activities to improve working efficiency in different sectors to ensure sustainable development.

The Tanzania Atomic Energy Commission (TAEC) has integrated ICT into its operations to enhance institutional efficiency and effectiveness (TAEC, 2020). As outlined in its Five-Year Corporate Strategic Plan (2018/2019–2022/2023), ICT is positioned as a fundamental enabler of the Commission's functions. The strategic plan emphasizes that "ICT would be a catalyst and powerful tool for change in the way people and institution's function," thereby demonstrating a deliberate institutional commitment to leveraging ICT to support organizational transformation and improve service delivery across various domains.

Numerous literature show that ICT can be used in different activities such as training and others to improve working conditions (Mdoe & Kimaro, 2006). Studies have shown that ICT has successfully helped in increasing awareness in different areas (Young, 2018) but it is not well known which ICT tools can be implemented for increasing public awareness on safe applications of atomic energy in Tanzania. This study therefore aimed on finding out which ICT tools and how they can be used to enhance public awareness on the safe applications of atomic energy and nuclear technology in Tanzania. Specifically, the study sought to assess the potential of various ICT platforms in

disseminating accurate information, increasing knowledge, and fostering positive perceptions among the public regarding the peaceful and safe applications of nuclear science and technology. Specifically, this study intended to:

1. Determine the attitudes of Tanzanians towards using ICT tools on raising awareness on atomic energy and nuclear technology in Tanzania.
2. Find out which ICT tools can be used in improving public awareness on atomic energy and nuclear technology in Tanzania.
3. Determine how the noted most widely used ICT tools in Tanzania can be used in improving public awareness on atomic energy and nuclear technology in the country.

This study highlights the ICT tools commonly used in Tanzania and examines how such tools can be leveraged to improve public awareness of the safe and beneficial applications of atomic energy and nuclear technology. Public awareness is essential because, while nuclear technology offers significant benefit, such as generating clean energy, advancing medical treatments, and supporting industrial development,. its misuse or mishandling can lead to serious health risks, environmental contamination, and safety hazards (World Nuclear Association, 2023; International Atomic Energy Agency [IAEA], 2020; Perrow, 2011). Additionally, the study explores attitudes of Tanzanians towards using ICT tools, thus, providing insights into both the accessibility and receptiveness of these platforms. By identifying effective tools and understanding public perceptions, the study offers guidance on implementing ICT strategies that can enhance knowledge, promote positive attitudes, and ensure the responsible and safe adoption of nuclear technologies in the country. To fulfil the specific objectives, the study answered the following three research questions:

RQ1 What are the attitudes of Tanzanians towards using ICT tools on getting awareness on atomic energy and nuclear technology in Tanzania?

RQ2 Which ICT tools can be used in improving public awareness on atomic energy and nuclear technology in Tanzania?

RQ3 How the noted most widely used ICT tools in Tanzania can be used in improving public awareness on atomic energy and nuclear technology in the country?

2.0 Literature review
2.1 Theoretical Perspective

Tanzanians have been using different ICT tools for information sharing in their daily lives. According to Alkamel and Chouthaiwale (2018), using ICT tools simplifies communication and allows users to enjoy the benefits of information in different ways. ICT tools can make knowledge sharing easy and cheaper as opposed to using the traditional ways (Das, 2019; Hakiman, Munadi & Ernawati, 2019; Guzman et. al., 2022).

Numerous theories can potentially guide this study on the use of ICT tools to improve awareness of atomic energy and nuclear technology applications in Tanzania. However, this study adopts the Diffusion of Innovations (DOI) Theory by Everett Rogers (1962) as the primary theoretical framework. DOI is particularly appropriate for this research as it provides a comprehensive explanation of how new ideas, practices, or technologies—such as nuclear technology—are communicated and adopted within a social system over time. The theory emphasizes the critical role of communication channels, including ICT tools, in facilitating the dissemination of information and shaping public understanding. By categorizing individuals into adopter groups (e.g., innovators, early adopters, early majority, late majority, and laggards), DOI enables an analysis of how awareness and acceptance of nuclear technology spread through the Tanzanian population.

In addition to DOI, the study employs the Technology Acceptance Model (TAM) developed by Da-vis (1989) as a complementary framework. While DOI focuses on the process of diffusion and the broader social mechanisms of information spread, TAM provides insights into the individual-level factors that influence the acceptance and use of ICT tools. Specifically, TAM posits that the perceived

usefulness (PU) and perceived ease of use (PEOU) of a technology are key determinants of users' behavioural intentions and actual usage. This is particularly relevant in the context of Tanzania, where varying levels of digital literacy, infrastructure, and socio-economic conditions may affect how different groups engage with ICT platforms designed to promote awareness of atomic energy. To ensure success on the use of the tools, the selected tools for improving awareness should be easy to use. For instance, using TAM, a study by Al-Adwan (2020) found that perceived ease of use and perceived usefulness continue to be critical factors in users' acceptance of educational technologies and therefore carefulness on the selection of tools should be considered for success.

Together, DOI and TAM offer a multidimensional approach: DOI addresses the macro-level process of awareness creation and adoption across the population, while TAM explains the micro-level decisions individuals make when interacting with ICT tools. The integration of these two theories allows for a more comprehensive analysis of both the spread of information and the factors influencing public engagement with ICT in the context of nuclear technology awareness.

2.2 Empirical Literature Review

Empirical evidence indicates that ICT tools, including social media platforms, websites, mobile applications, and radio/television campaigns, play a critical role in disseminating knowledge, shaping attitudes, and influencing behaviours among the general population. For example, Akinola and Ojo (2019) found that social media platforms were highly effective in educating the public about renewable energy technologies in Nigeria, highlighting the importance of interactive and accessible ICT tools in raising awareness. Similarly, Munyai et al. (2021) reported that mobile-based ICT interventions in South Africa significantly enhanced public understanding of health-related technologies, demonstrating the potential of ICT tools in influencing perceptions and knowledge across diverse contexts.

In the context of nuclear technology, Okafor et al. (2020) examined the effectiveness of ICT-based awareness campaigns on the safe use of atomic energy in developing countries. Their study revealed that communities exposed to targeted ICT campaigns exhibited higher levels of knowledge about nuclear safety measures and were more receptive to adopting safe practices. Likewise, Chakraborty and Das (2018) emphasized that ICT tools not only increase awareness but also foster positive attitudes toward nuclear energy, which is crucial for promoting the peaceful and responsible use of atomic technology.

Despite these positive findings, challenges remain in leveraging ICT for public awareness. Kabanda and Mtebe (2017) noted that limited digital literacy and uneven access to ICT infrastructure can constrain the effectiveness of ICT-driven campaigns, particularly in rural areas. These findings underscore the need for strategies tailored to the socio-economic and technological context of the target population.

Furthermore, understanding users' attitudes toward ICT tools is critical for their successful implementation (Karunaratne, Peiris, & Hansson, 2018). Assessing attitudes helps identify measures that can enhance effective usage. For instance, research has shown that gender influences attitudes towards mobile phone use (Mwalukasa, 2022), while knowledge levels regarding ICT use also affect attitudes toward these tools (Nirmalkar et al., 2022). Building on these insights, this study emphasises the importance of examining attitudes of Tanzanians toward ICT tools to improve public awareness of atomic energy and nuclear technology.

In the Tanzanian context, research specifically addressing the use of ICT tools for nuclear technology awareness remains limited. However, studies on ICT in science communication, such as Lyimo and Nkoma (2022), indicate that Tanzanians increasingly rely on mobile phones, social media, and radio for information dissemination. These findings suggest that leveraging ICT tools in Tanzania could significantly enhance public understanding of atomic energy applications, provided that interventions address issues of accessibility, usability, and cultural attitudes toward technology.

Building on the empirical evidence, this study is motivated by the need to enhance public awareness of atomic energy and nuclear technology in Tanzania. While ICT tools have proven effective in disseminating scientific knowledge and shaping attitudes in other contexts, research

specifically examining their use for nuclear technology awareness in Tanzania remains limited. Understanding how mobile phones, social media, radio, and other ICT channels can be leveraged is critical, as improved awareness can promote safe practices, reduce misconceptions, and foster positive attitudes toward the peaceful use of atomic energy. Addressing these gaps is particularly important given the potential benefits of nuclear technology in energy production, healthcare, and agriculture, as well as the risks associated with unsafe practices or misinformation.

2.3   Conceptual framework

The conceptual framework displayed in Figure 1 illustrates the relationship between the use of Information and Communication Technology (ICT) tools and public awareness of nuclear technology in Tanzania. The framework is grounded on the premise that ICT tools—such as social media platforms, mobile applications, websites, radio, and television—serve as key channels for disseminating knowledge, shaping attitudes, and influencing behaviors related to atomic energy and nuclear technology.
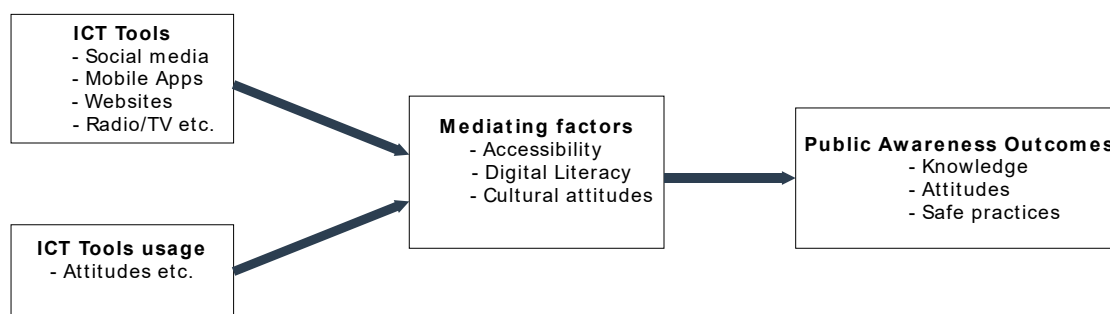

Figure 1. Conceptual Framework

3.0   Research Methodology

3.1 Research Approach

This study employed a mixed-methods research approach, integrating both quantitative and qualitative strategies to examine the role of ICT tools in raising public awareness of nuclear technology in Tanzania. Quantitative data were collected through structured questionnaires to assess the types and frequency of ICT use, as well as participants' knowledge and attitudes toward nuclear technology, allowing for statistical analysis of patterns and relationships. Complementing this, qualitative data were gathered through semi-structured interviews to gain deeper insights into participants' perceptions, experiences, and challenges with ICT-based awareness campaigns. By combining these methods, the study ensured triangulation of data, enhancing the validity and comprehensiveness of the findings while capturing both measurable outcomes and contextual factors influencing ICT effectiveness.

3.2   Research Design

This study adopted a descriptive research design to investigate how ICT tools influence public awareness of nuclear technology in Tanzania. The descriptive design was chosen because it allows for the systematic collection, analysis, and interpretation of data to describe the current state of ICT usage, public knowledge, and attitudes without manipulating the study variables. By combining quantitative data from questionnaires with qualitative insights from interviews, the design facilitated a comprehensive understanding of both measurable outcomes and contextual factors affecting ICT-based awareness campaigns. This approach enabled the researcher to identify patterns, relationships, and challenges in ICT adoption, as well as to explore participants' experiences and perceptions in depth, providing a robust foundation for informed recommendations.

3.3   Population

The study was conducted in six regions and focused on two key groups: Students from higher education institutions and members of the public. For the public, the target population was drawn exclusively from urban areas from the selected regions with eligibility restricted to individuals who had completed at least primary education. This criterion was set to ensure that participants possessed a basic level of literacy necessary for effective engagement with the research instruments.

3.4   Sample Size Determination
The study involved a sample of seven hundred and fifty (750) Tanzanian college students from fifteen (15) colleges/universities from six (6) regions in Tanzania; and one thousand two hundred (1200) non-students from participants in urban areas from the six regions in Tanzania. The calculation of the sample size was done using an online calculator (https://www.surveymonkey.com/mp/sample-size-calculator/). The selection of the colleges and universities based on a study on how aware these students were on the applications of nuclear technology in Tanzania and their perception of using ICT in increasing awareness in the society (Busagala & Kayanda, 2022). Participants from the colleges/universities and from the public were selected using simple random sampling (Creswell, 2016).

3.5   Quantitative data collection
Quantitative data were collected using structured questionnaires which were administered to a sample of participants drawn from diverse demographic groups, including university students, educators, and members of the public (other citizens in the selected region). Questionnaires were designed using the five-point Likert-scale with questions designed to measure respondents' levels of awareness and frequency. Questionnaires were distributed both physically and electronically, depending on the availability and accessibility of participants. For electronic distribution, tools such as Google Forms and WhatsApp were used to reach respondents in remote areas and urban centres. Data collection assistants were trained to guide respondents and ensure consistency and accuracy in responses. A printed questionnaire was distributed to the respondents. The administration of the printed questionnaire was face to face to the randomly selected respondents who agreed to participate in the study (Creswell, 2013). A total of fifty (50) copies of a questionnaire was printed for each college and two hundred (200) copies of a questionnaire for the other citizens in each region. The selection of the students was done through visiting their classes on campuses and request them to participate in the study while for the public citizens, a visit on their workplaces around the region was done. The response rates are shown in Table 1.

Table 1. Questionnaire response rate

Region	Public			University/College			
	Distribution	Response	Percentage	Number of Colleges	Distribution	Response	Percentage
Dar es Salaam	200	199	99.5%	3	150	139	92.7%
Kilimanjaro	200	194	97%	3	150	133	88.7%
Arusha	200	167	83.5%	3	150	140	93.3%
Morogoro	200	196	98%	1	50	49	98%
Dodoma	200	187	93.5%	3	150	138	92%
Pwani	200	172	86%	2	100	92	92%
Total	1200	1115		15	750	691	

3.6   Qualitative Data Collection

To complement the survey data, some respondents were invited to participate in interviews during the questionnaire distribution process. For those who consented, the interviews were audio-recorded, while for participants who declined recording, their views were documented in a notebook. In total, 13 students and 8 members of the public (including 3 educators and 5 other citizens) were interviewed. Each interview lasted between 25 and 40 minutes, allowing for in-depth exploration of participants' perspectives.

3.7   Data Analysis
Quantitative data were analysed using PSPP version 2.0.1, an open-source statistical software, while qualitative data were subjected to thematic analysis. For the quantitative analysis, a t-test was performed to compare the attitudes of the public and students as two groups, as well as to examine differences based on gender in the use of ICT tools. Descriptive statistics were calculated to examine patterns and frequency of ICT tool usage among the respondents. In the qualitative analysis, initial codes were generated from the data, which were then organized into themes by grouping related codes according to the research questions. Additionally, a comparative analysis of ICT tools was conducted to identify which tools are most frequently used in society and to determine usage differences between the public and students.

3.8   Ethical Consideration
This study adhered to research ethical standards to ensure the protection, rights, and dignity of all participants. Prior to data collection, informed consent was obtained from all participants, clearly explaining the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without penalty. Confidentiality and anonymity were maintained by assigning codes to the respondents and ensuring that no personally identifiable information was disclosed in the research findings. All interviews were conducted with participants' consent and whose responses were recorded solely for research purposes. Ethical considerations also ensured that participation did not expose respondents to harm or discomfort during the research process.

4.0   Findings and Discussion
Findings of this study are presented, discussed and structured in accordance with RQ1, RQ2, and RQ3 and described accordingly. In answering the first research question (RQ1) on attitudes of Tanzanians toward using ICT tools in raising awareness of atomic energy and nuclear technology in Tanzania, a t-test was carried out. The group statistics and the p-values have been presented and discussed. Generally, the findings show that only some people from the public and some students would prefer to use ICT tools to improve awareness on the applications of nuclear technology in Tanzania (Students: Mean=3.87, Public: Mean=3.80). The t-test analysis has also shown no significant difference between students and the public in urban areas on attitudes towards using ICT tools to improve awareness on the applications of nuclear technology in Tanzania ($p>0.05$). This means similar methods in applying ICT tools can be carried out to both groups. The low level of significant difference is likely due to the relatively high educational attainment of many urban residents, who, as noted by Kabanda and Mtebe (2017), may have a similar understanding of ICT tools as college students. These findings align with the literature emphasizing that attitudes toward ICT tools are influenced by knowledge and exposure to technology, which can shape willingness to adopt ICT for information dissemination (Karunaratne et. al., 2018; Nirmalkar et al., 2022; Mwalukasa, 2022). Furthermore, the findings are consistent with studies showing that access to and familiarity with ICT, such as mobile phones, social media, and radio/television, can positively influence attitudes and engagement in awareness campaigns (Akinola & Ojo, 2019; Munyai et al., 2021; Lyimo & Nkoma, 2022). Tables 2 and 3 present the group statistics and the t-test results respectively.

Table 2. Group Statistics on Students and the Public Attitude

	Group	N	Mean	Standard Deviation

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| Attitude towards using ICT tools | Student | 619 | 3.87 | 0.71 |
| | Public | 936 | 3.80 | 0.69 |

Table 3. T-test Results on Comparing Attitudes between Students and the Public

		Levene's Test for Equality of Variances		T-Test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	Percentage
									Lower	Upper
Attitude towards using ICT tools	Equal variances assumed	3.00	0.084	-1.34	637	0.181	-0.08	0.06	-0.19	0.04
	Equal variances not assumed			-1.37	474.62	0.172	-0.08	0.06	-0.19	0.03

Apart from a comparison between students and the public, a t-test was also carried out based on gender whereby attitudes of female students were compared with those of male students; and the same was done to females and males among members of the public. The findings revealed that only some male and female students would prefer to use ICT tools to improve awareness on the application of nuclear technology in Tanzania (Male: Mean=3.83, Female: Mean=3.90). The t-test analysis showed that there is no significant difference between male and female students in their attitudes ($p > 0.05$) which may imply that both groups are likely to accept any method to be used for awareness creation.

Findings also revealed that many females (Mean=4.09) than males (Mean=3.65) from the public would prefer to use ICT tools to improve awareness of the applications of nuclear technology in Tanzania. The t-test analysis showed that there is a significant difference on attitudes ($p < 0.05$) between the two groups. This may imply that may be older women have more time to use ICT tools than is the case with both older men and students or maybe older women are more concerned or worried about the effect of nuclear technology on their families and therefore they are more eager to know than is the case with men.

These results are consistent with what is reported in literature suggesting that gender can influence attitudes toward ICT adoption, particularly when awareness or personal relevance is involved (Mwalukasa, 2022; Karunaratne et. al., 2018). Additionally, the higher engagement of women aligns with studies highlighting the role of perceived relevance and concern in motivating ICT use for educational and awareness purposes (Akinola & Ojo, 2019; Munyai et al., 2021).
Surprisingly, the findings of this study found female as more interested in knowing about atomic energy issues and in using ICT tools than is the case with men which at some points contradicts the results from Mwalukasa, (2022) that boys would prefer technology than girls based on the Tanzanian cultural behaviour where boys are allowed to participate more on ICT technology than girls.

Tables 4, 5 and 6 present the group statistics, and the t-test analysis results on students and the public based on gender respectively.

Table 4. Group Statistics on Students and the Public Attitude Based on Gender

Students			
Group	N	Mean	Standard Deviation

Attitude towards using ICT tools	Male	419	3.83	0.72
	Female	220	3.90	0.67
Public				
	Group	**N**	**Mean**	**Standard Deviation**
Attitude towards using ICT tools	Male	581	3.65	0.73
	Female	337	4.09	0.51

Table 5. T-test results on comparing the students attitude based on gender

		Levene's Test for Equality of Variances		T-Test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		Percentage
									Lower	Upper	
Attitude towards using ICT tools	Equal variances assumed	3.00	0.08 4	-1.34	637	0.181	-0.08	0.06	-0.19	0.04	
	Equal variances not assumed			-1.37	474.62	0.172	-0.08	0.06	-0.19	0.03	

Table 6. T-test result on comparing the public attitude based on gender

		Levene's Test for Equality of Variances		T-Test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		Percentage
									Lower	Upper	
Attitude towards using ICT tools	Equal variances assumed	0.15	0.701	1.91	1553.00	0.056	0.07	0.04	0.00	0.14	
	Equal variances not assumed			1.90	1300.86	0.057	0.07	0.04	0.00	0.14	

To address the second and third research questions (RQ2 and RQ3), which focused on identifying which ICT tools and how they can be used to enhance public awareness of the safe and peaceful applications of atomic energy and nuclear technology in Tanzania, descriptive statistics on the daily usage of ICT tools among respondents were employed. These quantitative findings were further supported and enriched by qualitative data from interviews, thus, providing a comprehensive

understanding of ICT tool usage patterns and their potential for improving public awareness. The study found that many (34%) respondents prefer to use WhatsApp as a social media followed by Instagram, Facebook, YouTube and Snap Chat respectively. It was also found that many (36%) respondents prefer to listen to the radio in day time and watch television at night. Table 7 presents the summary.

Table 7. Summary of the Findings on the Daily Usage of ICT Tools among Respondents

The use of social media		Listening to radio		Watching television	
WhatsApp	34%	Morning	8%	Morning	2%
Instagram	28%	Day time	36%	Day time	12%
Facebook	28%	Evening	28%	Evening	28%
YouTube	26%	Night	20%	Night	31%
SnapChat	24%	Do not listen	8%	Do not watch	27%

It is seemingly therefore social media are taking a lead in the use of ICT tools rather than conventional tools such as radio and television. These findings suggest that ICT-based awareness campaigns in Tanzania should adopt a multi-platform approach, combining widely used social media platforms with traditional radio and television broadcasts. Leveraging WhatsApp, for example, could facilitate interactive messaging and community engagement, while radio and TV programs can reach broader audiences, particularly in areas with limited internet access. Tailoring content to the daily media consumption habits of the population may enhance the effectiveness of campaigns aimed at improving public understanding of nuclear technology and its safe applications. Apart from the quantitative results presented, the qualitative data were also analysed and two themes were formed namely, interest in knowing atomic energy issues and using ICT tools.

4.1 Interest in Knowing Atomic Energy Issues
People had different thoughts on atomic energy and nuclear technology issues, as many do not think that knowing about it was necessary but some seemed interested in hearing what it is all about. For example, one respondent from the public said, "… *after knowing these things then what … I don't think it's necessary … " but another one said, "I never knew Tanzania uses nuclear technology … I would like to hear …" (Respondent 2, Female normal citizen, 18 March 2024).*

Most of the students think that such issues are more scientific and difficult to understand and therefore they are not sure if they would be interested in knowing more about them. For example, one student said, " *...these are scientific issues... I am not sure if I need them...*" (Respondent 8, Male student, 10 February 2024). Another one said, "*I think nuclear technology is complicated... for us Tanzanians it will be difficult ...*"(Respondent 1, Male student, 23 February 2024). These responses alert TAEC to ensure that their programmes should demystify matters on nuclear technology.

4.2 Using ICT Tools
According to Okello et al., (2020) and Karunaratne, Peiris and Hansson, (2018), Internet costs and poor connectivity are among the challenges on the use of ICT tools. This study also found the same as most (57%) of the respondents showed doubts on the use of social media due to costs of the internet and poor connectivity, especially on rural areas. A study by Alkamel and Chouthaiwale, (2018) showed that radio and television are cheaper; thus concurring with this study as most (61%) of the respondents proposed the use of radio and television as they said to have been cheaper to use and more accessible by many Tanzanians than is the case with smartphones. For example, one student said, "*... internet is expensive ... I would like to use YouTube but I don't think I will afford …*"(Respondent 5, Female student, 10 February 2024). One male from the public said, "*... internet is still expensive, I think it's better you use radio and TV ... I think many people will hear...*" (Respondent 1, Male normal citizen, 16 March 2024). All the same, the lessons from this study include the reality that having segmentation of target groups would be a good idea in ensuring that the whole society is reached.

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5.0   Conclusions

This study is valuable in highlighting key considerations for improving public awareness of the safe and peaceful applications of atomic energy and nuclear technology in Tanzania. While previous research has examined the general use of ICT tools for information dissemination, there remains a notable gap in studies that specifically address how these tools can be adapted to communicate complex and technical subjects such as nuclear science to the Tanzanian population. The findings of this study can guide TAEC and related agencies in identifying the most effective ICT tools for enhancing awareness and in developing strategies for their effective implementation. Furthermore, the study underscores the potential of ICT in educating the public and promoting a safe, informed, and constructive approach to the applications of nuclear technology in Tanzania.

6.0 Recommendations

Based on the findings the study recommends the following to be considered during the implementation process.

Segmentation of target audiences is important in reaching the community. More sessions on the matter could be placed on the least cost tools such as radio and television as recommended by most of the respondents. Information broadcasting should consider the times at which many people listen to the radio or watch television as shown by the results in Table 7.

Recorded sessions from the radio and television presentations and more can be put on different social media for users who can afford to use them. TAEC should strengthen its collaboration with mainstream media to ensure that its public activities are widely covered and reported in daily news outlets. Since a larger segment of the population tends to engage with regular news broadcasts rather than attending specialized sessions on atomic energy and nuclear technology, media coverage would significantly enhance public reach and awareness.

The government through TAEC and related agencies should strengthen and support radio and television broadcasting agencies to expand their reach into rural areas, ensuring that a larger segment of the Tanzanian population can access critical information on the development opportunities and benefits offered by atomic energy and nuclear technology. The government through TAEC and related agencies should support knowledge distribution on developmental issues through social media by creating better policies to guide the service providers on the use of social media in Tanzania which can be affordable to more people in the society.

This study makes a significant contribution to the existing body of knowledge by deepening the understanding of how ICT tools can be effectively applied in nuclear education and awareness within the context of a developing country such as Tanzania. The study generates new empirical evidence, enriches the theoretical discourse on the role of ICT in science communication, and offers practical guidelines that can inform policy and practice. In doing so, the study addresses the existing gaps in research on public awareness and engagement with nuclear science in Tanzania, thereby strengthening both academic scholarship and practical efforts in science communication.

7.0   Limitations of the Study and Future Work

The findings of this study can be helpful in guiding the atomic energy and nuclear technology in Tanzania agencies on which ICT tools can be better used to improve the awareness of the safe and peaceful applications of atomic energy and nuclear technology in Tanzania and how better the technologies can be implemented. The study evaluated the ICT tools based on students and the public in urban areas. More studies on rural areas and with more students from more colleges and universities are called to make the findings of this study more generalizable.

8.0   Acknowledgment

(https://www.grammarly.com/) in refining the academic language and accuracy of some selected paragraphs in this work. The tool was applied to enhance the academic tone, grammatical structure, and clarity of expression. All outputs generated were carefully reviewed, adapted, and modified to suit the context and objectives of the final manuscript.

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