

**TRANSITIONING TO A CLIMATE-RESILIENT SOCIETY: EMPIRICAL EVIDENCE
ON WHAT DRIVES THE ADOPTION OF GREEN COMPUTING POLICIES
IN NIGERIAN ORGANISATIONS****Koleayo Oluwafemi Omoyajowo^{1*}, Mary Adetutu Adewunmi², Kolawole Ayodeji Omoyajowo³,
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Promoting all efforts that centres around environmental sustainability is a collective responsibility. This paper recognizes the axiom that embracing green computing principles across all sectors, not just in corporations, leads to low-carbon development strategies and contributes positively to our planet. Hinged on this perspective, this study was poised to succinctly identify what drives the adoption of green computing policies, justify them, and recommend strategic policies based on the existing experience of other developed countries. The present study employed convenience sampling, a widely used non-probability sampling method, where participants are selected based on their availability and willingness to participate in the study. Limitations that hinder the adoption of green computing policies in some Nigerian organizations were examined. Primary data was collected from 52 participants, specifically top managers on the awareness, adoption, or practice of green computing policies in their affiliated organizations. Most respondents claimed awareness of green computing policies, while the use of power management features was considered the most adopted green initiative. However, when respondents were asked whether their organizations were doing enough to reduce their carbon footprint and operational cost through green computing initiatives, most respondents (61.5%) claimed their organization was not doing enough in this regard. It is important to note that this study considered several factors that are critical for the adoption of green computing, namely knowledge transfer, financing, availability of basic infrastructure (energy supply), presence of investors and the increasing number of recycling centres. Additionally, this paper reasoned that achieving a climate-resilient society, particularly through the adoption of green computing principles, necessitates ongoing and deliberate efforts focused on public awareness, green investment, and stringent corporate green policy guidelines, with a focused training approach for every member of the organization.

Keywords: information technology; green computing; climate change; environmental sustainability; Nigeria.

INTRODUCTION

Information Technology (IT) plays a crucial role in advancing global industrial development and enhancing the pace of civilization in diverse societies across the world. We make use of information technology in different aspects of our daily lives, and it has even become second nature to us. It has revolutionized the way we think, work, communicate, learn, and entertain ourselves. For instance, we employ electronic mailing technologies and wireless communication devices to keep in contact with family, friends, and associates. We also use computer-based systems to access different services in the healthcare, transportation, security, education etc. For emphasis, IT has transformed industries such as finance, healthcare, education, transportation, and many more, by making processes more efficient, faster, and more accurate. For instance, in the finance industry, IT has enabled the automation of many financial transactions, making them faster and more accurate, while in healthcare, IT has improved patient care by facilitating the exchange of medical records and making diagnosis and treatment more precise. We believe IT has brought a remarkable socioeconomic development of every nation in the world, but there have also been some other public concerns. These concerns are premised on the great deal of energy expended during manufacturing, use and maintenance of IT equipment (e.g., computers, servers, and the latter, the danger that accompanies the use and disposal of IT equipment) (Omoyajowo, 2016). For instance, non-renewable resources, including precious metals like gold, are used to

make technology even though many others, such as coal, are consumed to generate the electricity to use technology. The increasing demand for computing power has led to an exponential increase in energy consumption, resulting in significant greenhouse gas emissions and contributing to global warming. In other words, one of the critical disadvantages of IT is the issue of E-waste. As technology evolves rapidly, older devices become obsolete, leading to an ever-increasing amount of electronic waste. E-waste is hazardous and difficult to dispose of, and improper disposal can lead to soil and water pollution, health hazards, and resource depletion. As shown in previous studies by other authors, there is a significant load on electrical networks when using home and office computers. This is based on the average energy consumption of each computer of 746 kW/year, which is significantly higher than the energy consumption of a refrigerator, which requires about 500 kW to operate. (Akana et al., 2019). The growing demand for computing power has led to an exponential increase in energy consumption, because of which the amount of greenhouse gas emissions has increased significantly, which is the cause of the development of global warming processes.

Some studies have also linked frequent exposure to IT equipment with some human physiological disorders, e.g., serious respiratory diseases, eye strain, headaches, and musculoskeletal issues like carpal tunnel syndrome or repetitive strain injuries etc. A previous report suggested that frequent computer use, which contributes to technology addiction, also has a negative impact on health. The consequences of such dependence can be obese and carpal tunnel syndrome (CMU, 2022). Bellieni, et al., (2012) particularly reported that development of tumours in pregnant women and

unborn children may be triggered by non-ionizing radiation from laptops. The article suggests that exposure to non-ionizing radiation from laptops can potentially lead to tumour development in pregnant women and fetuses. Non-ionizing radiation is a type of radiation that does not have enough energy to remove electrons from atoms or molecules and cause ionization. However, it can still be detrimental to living organisms, including heating tissue and altering cell function. A similar study showed that sperm quality may be reduced due to the dangers of radio frequency radiation from Wi-Fi (if the laptop uses the Internet wireless LAN), as well as due to electromagnetic fields generated by the internal circuit electronics of the laptop (Mortazavi, et al., 2016). This finding suggested that exposure to the heat generated by personal computers (PCs) and laptops can increase the temperature of the scrotum, which may denature proteins and other macromolecules in the sperm cells and hence, affecting sperm quality. More so, the study also suggested that exposure to electromagnetic radiation (EMR) can lead to oxidative stress and DNA damage in sperm cells, which can also decrease sperm quality and increase the infertility risk. In fact, Aderemi et al. (2019) posited that EMR from a charging laptop can significantly affect semen quality, male fertility and rendered male reproductive hormone unstable. Their experiment on male albino rats showed that exposure to laptop computer display unit was associated with significant reduction in sperm motility, sperm viability and sperm count ($P < 0.0001$), testosterone level ($P < 0.001$), follicle stimulating hormone (FSH) level ($P < 0.01$) at different exposure period (2, 4, 6 and 8 hours) for 4 weeks.

Electronic waste is one of the serious problems associated with IT. As technology rapidly advances, older devices become obsolete, resulting in an ever-increasing amount of E-waste. E-waste is hazardous, difficult to dispose of, and improper disposal can lead to soil and water contamination, health hazards, and resource depletion. Since most IT equipment is made of toxic metals (cadmium, lead, mercury, etc.), the leaching of these metals into soil and water during disposal of electronic waste has serious negative consequences for drinking water, plant products, and animals (Omoyajowo, 2016). Consumption of contaminated fish and water contributes to the development of neurological diseases and increases the risk of cancer. When electronic waste is burned (as often happens in developing countries), extremely toxic dioxins and furans are released into the atmosphere. These substances are known to contribute to the development of lung cancer and other respiratory diseases in populations living in areas where these toxicants are distributed (Li, et al., 2007).

Many enterprise IT departments are implementing green computing initiatives to reduce the environmental impact of their IT operations. According to the report, IT could account for 2% of total carbon emissions. However, even 2% can play a decisive role in the current environmental situation. In this regard, environmental scientists are constantly working on new ways to help the IT sector align all IT processes and practices with the core principles of sustainable development. These principles are mainly about reducing, reusing, and recycling; with minimal or no environmental impact (Servaes, 2012). Thus, strategies for reducing IT-related emissions therefore include activities or efforts improving the energy efficiency of IT equipment, increasing the use of renewable energy in the production and distribution of electricity, and promoting sustainable manufacturing and disposal practices.

Green computing (GC) has stimulated the need to rethink energy efficiency and reduction of CO₂ emissions since "thinking and going green" is in the best interest, both in terms of public health

and reduced costs (Letlonkane & Mavetera, 2014). Murugesan (2008) described green computing as "the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems – such as monitors, printers, storage devices, and networking and communications systems – efficiently and effectively with minimal or no impact on the environment". The Energy Star program in 1992, which was established to encourage people to efficiently manage energy use through the labelling of energy efficient products, e.g., LED Monitors, TV, and other electronic gadgets, could be linked to the history of green computing.

LITERATURE REVIEW

Modern green IT process concepts

Several green initiatives and policies have been suggested to mitigate the ecological impact of computing and all IT processes, these green policies are grouped under the following concepts' viz: green design, green manufacturing, green purchasing, green use, and green disposal. Green use elicits the responsible and efficient way of managing the energy consumed by IT equipment e.g., Use of sleep mode or turning off IT equipment when not in use, printing only when necessary, printing on both sides, software virtualization and cloud computing etc. Green disposal illustrates the responsible way of disposing off IT equipment e.g., donating and refurbishing of old computers for reuse as well opting for upgrade, and conveying defunct IT equipment or E-waste to professional technicians so that valuable metals and other components could be assembled for raw material re-use. Green design elicits the responsible way of assembling IT components that are light/compact, durable (having a long-life span), energy efficient, biodegradable, non-toxic, and easily recoverable. Green manufacturing describes both the energy-efficient way of manufacturing IT equipment and the production of electronic gadgets with green designs. E.g., manufacturing of LED monitors would be considered "green" instead of the cathode ray tube (CRT) monitors. Green purchasing describes the rational decision or behaviour to purchase green equipment that is compact, consumes less electricity, and has extended product life with little or no effect on human health or the environment.

Little is known about available factors and existing barriers that may influence adoption of green computing policies, especially among Nigerian organizations. A report opined the government agencies spend so much on procuring computers and IT equipment due to their frequent replacement or as they hire more staff (McCabe, 2008). Another report asserts that most organizations often replace their computers with newer ones within 3 – 5 years (Vreeswijk, 2008). In this regard, when old computers are thrown into landfills, this approach provokes the beginning of the processes described above. Adopting green computing comes with great benefits. Because it strives for energy efficiency, it saves energy bills and reduces printing costs, E-wastes are reduced and better managed, risk of exposure to warming heat and radiation from conventional IT equipment would be reduced.

To this appreciable end, it is important to stressed that the integration of green computing strategies does not only contributes to lowering energy demand and emissions or fostering sustainable practices across industries reliant on digital technologies but in a broader perspective, it positively contributes towards the mitigation of climate change and environmental sustainability (Raimi et al, 2018; Omoyajowo et al., 2022). In other words, all the environmental concerns discussed above could be largely managed if principles of green computing are fully implemented. For this reason, green computing should be seen as an environmental sustainability concept that ensures that the computing or technological needs of present and future

generations are met. Like telecommuting concept described in Omoyajowo et al. (2021) and every other green concepts or solutions, the potential to reduce operating cost and offset businesses' carbon footprint is a stake reality.

Environmental awareness as a driver of green computing

Environmental awareness is an important factor in reducing the environmental footprint of individuals and businesses (Xie et al., 2024). Environmental values, beliefs, and attitudes of employees within an organization are typically shaped by factors such as environmental awareness and environmental ethics (Biswas et al., 2022). As people become more aware of the impact of their actions on the environment, they are more likely to take steps to reduce their ecological footprint, such as conserving energy, reducing waste, and using eco-friendly products and services. Individuals who are environmentally aware may make lifestyle changes that may have a significant impact on reducing their personal carbon footprint (Omoyajowo et al, 2023). Their study observed that adoption of green computing practices was evident among spiritually/religiously inclined individuals. These individuals demonstrated willingness to support green computing principle, such as turning off lights and appliances when not in use, donating unused possessions, as well as other environmental stewardship programs like planting trees, keeping gardens without harmful chemicals. Moreover, their study found that spiritually-inclined individuals tended to embrace green computing principles by purchasing energy-efficient appliances like LED TVs, monitors, and bulbs, as well as telecommuting principles which is literally reducing unnecessary travels and expenses when flexible job arrangements is allowed.

Chinese researchers conducted a study on the relationship between stakeholder pressure, environmental awareness and ethics for green innovation and performance to offer important insights for effective policy choices and organizational initiatives to improve the environmental performance of organizations. The specific challenges and opportunities faced by firms in developing countries were considered when developing ideas (Xie et al., 2024). The study found that stakeholder pressure is positively associated with environmental performance. At the same time, regulators, competitors, and clients were considered as interested parties.

In searching for ways to motivate the population's participation in the transition to a green lifestyle, Korean scientists have discovered interesting facts. The study found that educating the public about the positive effects of adopting a green lifestyle is more effective than complying with regulations. In addition, when raising public awareness, emphasizing health or economic factors rather than social factors is more effective in promoting the adoption of green lifestyles among the population (Ha et al., 2023).

Pakistani scholars have attempted to establish the level of awareness and acceptance of GC policies among university librarians. A notable result is that the library's environmental issues did not have a significant impact. For GC acceptance, personal norms were the most influential factor, with the relationship between awareness of consequences and personal norms being very strong (Tariq & Khalid, 2023).

A study of the main factors and challenges in the application of green IT in the private sector in Saudi Arabia revealed the most critical ones. Thus, the culture of Saudi society and the security issues associated with the virtualization approach were identified as external issues; while the budget of the organization and the policies of the organization are internal tasks (Al-Zamil & Saudagar, 2020).

Malaysian scholars have concluded that employee attitudes play a key role in motivating participation in green computing practices (Ojo et al., 2019). In their study, the authors concluded that green IT knowledge, social influence and the management culture directly shape attitudes. To clarify the formation of people's attitudes and behaviour towards environmental practices, it is necessary to consider the social context.

Similarly, enterprises that prioritize environmental sustainability can also reduce their ecological footprint by implementing green practices such as energy-efficient technologies, sustainable supply chains, and responsible waste management. Businesses can attract environmentally conscious consumers and improve their own reputation by adopting sustainable practices and reducing their impact on the environment.

Besides, to individual and corporate actions, government policies and regulations can also encourage environmental awareness and reduce the ecological footprint of society. For example, policies that promote renewable energy, energy efficiency, and waste reduction can help reduce carbon emissions and conserve natural resources. However, there are barriers to the implementation of green (sustainable) computing policies in Nigerian organizations that have not been researched or scientifically substantiated to date. Without understanding the barriers, it is impossible to develop a sustainable strategy for the development of green (sustainable) computing policies.

Due to the above-mentioned relevance of green computing policy adoption, the current study attempts to provide insight into the key drivers and barriers to adoption, as well as best practices for promoting and implementing green computing policies in organizations. The purpose of the study is to identify barriers to the adoption of green (sustainable) computing policies, justify them and propose a strategy based on the existing experience of other countries. This information may be useful to policymakers, industry leaders and other stakeholders interested in promoting environmental sustainability in Nigeria and beyond. Accordingly, the current study aims to identify the factors and barriers to GC as well as most effective GC policies of organizations and seeks to answer the following questions:

Question 1: What is the level of awareness among workers in Nigerian organizations regarding green computing policies?

Question 2: What is the availability of eco-friendly IT gadgets?

Question 3: What is the role of funding among other factors influencing the adoption of green computing policies? What are the possibilities for organizing resources for energy saving.

METHODOLOGY

This study used the most common non-probability sampling method, namely convenience sampling (Figure 1). This is a sampling in which participants are selected based on their availability and willingness to participate in the study.

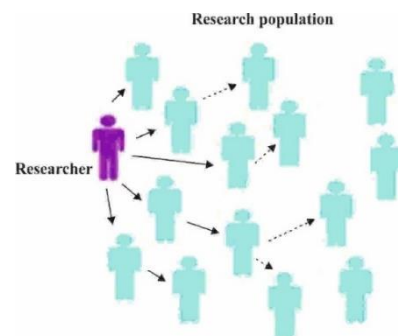


Figure 1. Research method of the current study: a convenience sample

In this case, the data were collected from a survey conducted in November 2016, where 52 participants were selected through convenience sampling and a validated questionnaire was used. The participants recruited were top management staff from reputable organizations, each holding at least a bachelor's degree and working onsite at Lagos Island, Lagos, Nigeria. Questions on the awareness, adoption, or practice of green computing policies were examined. Participants were interviewed on whether their affiliated organization adopted green computing or not by presenting to them multiple choice responses and an open-ended sentence. Participants were also asked about the factors that they perceived might influence the adoption of green computing policies. Various factors that may influence the adoption of green computing policies, including organizational culture, management support, financial resources, and employee awareness, were thoroughly examined. Data were analysed using descriptive statistics on MS Excel. Using descriptive statistics helped unveil the unique findings of this study, specially to understand the distribution of data and identify any outliers or patterns.

RESULTS AND DISCUSSION

When respondents were asked if they knew what green computing was (after briefing them on the meaning), most respondents claimed awareness on the subject (54%). Interestingly, when options of green computing policies were presented to respondents, they were able to identify with at least one "green" initiative being adopted or in practice in their organization. The use of power management features ranked the most adopted green initiative by the organization, followed by procurement of green IT equipment (Table 1).

The rest of the green initiatives assumed the following order: Paperless policy – Efficient data utilization by visualization – Responsible e-disposal policy. The implication of this outcome is that every organization sampled in this study adopted at least a green policy which was beneficial to the environment in saving unnecessary depletion of natural resources and offer them the opportunity to save operational cost. Indeed, the use of power management features and procurement of green IT equipment are popular green computing initiatives among organizations because they offer significant cost savings, environmental benefits, regulatory compliance, and public perception advantages. However, when respondents were asked if their organization was doing enough to reduce carbon footprint and save costs through green computing initiatives, most of the respondents (61.5%)

said that their organization was not doing enough from that standpoint. While studies have shown that the rate of increase in annual CO₂ emissions from data centres currently accounts for about 12% of global emissions. This clearly implies that Nigerian organizations need to do better in aligning their workflow operations with the core principles of sustainability (reduce, reuse, and recycle). It is also recommended that when purchasing new computers, give preference to equipment with optimized processors, disks, and servers with low power consumption; apply cache management strategies that can affect the sequence of disk access requests, which directly affects the energy consumption of storage systems; regulate energy consumption by optimally organizing the ventilation air flow of rooms with computerized workstations (Rong et al., 2016).

At the same time, government agencies should sensitize organizations on green policies and corporate environmental responsibility because green policies such as green computing helps reduce operating costs and help increase employee productivity, which benefits organizations who implement such. Additionally, it is important to raise awareness about the benefits of these initiatives, provide incentives and support for organizations to invest in green computing, and implement government regulations that promote environmental sustainability. It is also critical to address the infrastructure challenges that may be preventing organizations from adopting these practices (Figure 2).

The findings of the study indicate that poor awareness, limited financing, fewer recycling centres, and affordability of eco-friendly IT gadgets are some main setbacks to the adoption of green computing policies among Nigerian organizations. These factors are common barriers to the adoption of green computing practices in many developing countries, including Nigeria.

Poor awareness is a significant barrier to the adoption of green computing practices because many organizations may not be aware of the benefits of these practices, the technologies, and tools available to support them, or the environmental impact of their IT activities. This can prevent organizations from making informed decisions about adopting green computing policies and investing in the necessary infrastructure and equipment. Therefore, improving awareness is critical to overcoming barriers in green computing adoption. Effective communication, including interdisciplinary collaboration and the use of storytelling, humour, and celebrity influence, can greatly enhance understanding and promote action on subjects of great environmental interest (Omoyajowo et al, 2024).

Table 1. Corporate attitude and awareness of green computing policies and its components (number of participants (firms) – N = 52)

Name indicator	Indicator value	
	pcs	% (*rank)
1. Awareness on green computing		
Aware	28	54
Not aware	24	46
2. Adopted green initiatives by organizations*		
Responsible e-disposal policy: Defunct IT equipment are either donated, sold, or moved to appropriate recycling facilities	12 (23%)	5th
Procurement and use of green IT equipment (e.g., thin client) throughout the year	20 (38%)	2nd
Use of power management features e.g., sleep mode, turn off during idle time etc.	24 (46%)	1st
Paperless policy or printing only when necessary	19 (36.5%)	3rd
Efficient server utilization by visualization	16 (31%)	4th
3. Corporate attitude towards green computing policies (Is your organization doing enough to reduce carbon footprint and save cost through green computing initiatives?)		
Yes	20	(38.5%)
No	32	(61.5%)
Not sure	0	0

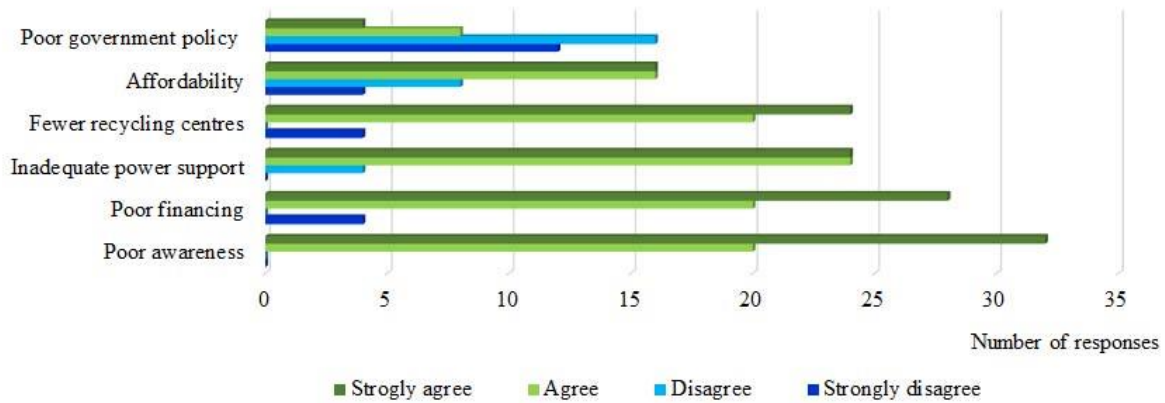


Figure 2. Constraints facing the adoption of corporate green computing policies (number of participants (firms) – N = 52)

Limited financing is another significant barrier to the adoption of green computing practices, as many organizations may not have the financial resources to invest in eco-friendly IT equipment or manage recycling programs. This can prevent organizations from prioritizing green computing initiatives over other business activities, and may also limit their ability to meet regulatory requirements related to environmental sustainability.

Fewer recycling facilities can also be a barrier to the adoption of green computing practices, as organizations may find it difficult to dispose of their E-waste in an environmentally-friendly manner. This can make it difficult for organizations to comply with regulatory requirements related to E-waste management and may also create environmental hazards. An earlier study noted that COVID-19 pandemic has the potential to disrupt corporate waste management policies, suggesting that prolonged pandemics could mire the operation of available recycling facilities, all of which is emphasizing the urgent need for enhanced waste management policies and awareness campaigns to mitigate these risks (Omoyajowo et al, 2022). However, the problem of fewer recycling facilities can be addressed by investing in the development of more recycling facilities and expanding existing infrastructure to accommodate the growing volume of E-waste generated by organizations. Additionally, government regulations and policies should be strengthened to incentivize the proper disposal and recycling of E-waste, encouraging organizations to comply with environmental standards. Nevertheless, promoting awareness among businesses about the importance of responsible E-waste management and offering support for initiatives like electronics take-back programs or partnerships with certified recyclers can facilitate the safe and sustainable disposal of electronic equipment. It is also imperative to consciously improve access to recycling facilities in order to foster a culture of environmental responsibility, where organizations can overcome the challenges associated with E-waste disposal and contribute to greener computing practices.

Importantly, the affordability of eco-friendly IT gadgets can be a significant barrier to the adoption of green computing practices, as many organizations may not be able to afford the latest eco-friendly IT equipment. This can prevent organizations from adopting more energy-efficient and environmentally-friendly IT equipment and may limit their ability to reduce their carbon footprint. However, promoting partnerships for leasing or rental programs with IT manufacturers, encouraging circular economy practices like refurbishing and reusing IT equipment, and investing in research and development for eco-friendly technologies can collectively lower costs and enhance accessibility of green

computing solutions, enabling organizations to overcome financial barriers and advance energy efficiency while reducing their carbon footprint.

Additionally, another strategic solution to address the foregoing discourse beyond raising awareness about the benefits of green computing practices is to provide financial incentives and support for organizations to invest in eco-friendly IT equipment and manage recycling programs, this solution will really encourage new startups, and strengthens existing ones and promote the development and affordability of eco-friendly IT gadgets in the long run. This can help organizations in Nigeria and other developing countries to adopt green computing practices and reduce their environmental impact.

Some studies have corroborated that these factors identified in this study may contribute to the unsustainable use of resources, increasing corporate ecological footprint. Lack of knowledge on green initiatives slows down national development hence, government are critically required to reinforce adoption of green policies through sensitization programs and proper legislative frameworks that reward organizations that entrench sustainability within their business practice. Poor financing to procure eco-friendly IT equipment may impede the adoption of green computing initiatives in that when businesses face an existential threat, they usually do not think of "green financing" as an option. Green financing encompassed innovative financial products, markets, policies, and institutions to support energy-saving and environmental protection industries and the economy. Hence, providing the enabling business environment for organizations including the small and medium enterprises would eliminate poor financing and consequently, capabilities revolving to green initiatives would be developed, and green innovation would permeate through.

From a broader perspective, finance has a significant impact on the structure and development of the corporate decision and mission. Based on the premise that green computing encourages recycling and reusability of materials to reduce electronic waste, having fewer recycling centres may be considered a constraint to the adoption of corporate green computing. However, more efforts should be made to awake genuine concern for green policies such that corporate entities, especially in developing climes, can take consolidated precautions to track their ecological footprint and take extra effort in embracing green policies into the workplace. Respondents identified inadequate power supply as a constraint to the adoption of green computing perhaps because it is difficult to synchronize "energy efficiency and waste reduction" being the fundamental concept of green computing with "inadequate electricity supply" being the case in Nigeria and some developing climes. The constraint of inadequate power supply identified by the respondents is a

significant challenge to the adoption of green computing practices in Nigeria and other developing countries. The fundamental concept of green computing is to reduce energy consumption and waste, which requires reliable and efficient power supply. Inadequate electricity supply in Nigeria and other developing countries can make it difficult for organizations to adopt green computing practices and invest in energy-efficient IT equipment.

Inadequate power supply can create several challenges for organizations trying to adopt green computing practices. For example, organizations may not be able to rely on renewable energy sources, such as solar or wind power, to support their energy needs, which limits their ability to reduce their carbon footprint. Additionally, the use of diesel-powered generators to supplement electricity supply can increase energy consumption and create more carbon emissions, which is counterproductive to the goal of green computing. In contrast, renewable energy can not only make the energy consumed clean, but also store excess energy in batteries for revenue generation (Sheme et al., 2018).

To overcome the challenge of inadequate power supply, it is important for the Nigerian government and other stakeholders to invest in improving the electricity infrastructure in the country. This could involve investing in renewable energy sources, such as solar and wind power, to supplement the national power grid and reduce reliance on diesel-powered generators. It could also involve implementing policies and incentives to encourage organizations to adopt energy-efficient IT equipment and practices, such as virtualization and cloud computing.

Bringing together these views, the challenge of inadequate power supply in Nigeria and other developing countries underscores the need for a holistic approach to the adoption of green computing practices. It requires a combination of policy, investment, and education to create an enabling environment for organizations to adopt and implement green computing practices that are both environmentally-friendly and economically viable. We therefore reasoned that the concept of green computing should be taught at different levels and people in developing climes should be made to realize that seeking for alternative renewable energy for computing is within the deliverables of the concept. Additionally, overcoming these hurdles requires that organizations should invest more in green infrastructures.

CONCLUSION

This present study acknowledged that green computing is an environmentally sound and cost-effective practice that has the potential to benefit organizations in terms of reducing their ecological footprint and reducing operational cost spent in extra use of energy and resources. There are much more benefits to tap from the concept if considered as a holistic energy efficiency and waste reduction concept. The fact that the level of awareness about green computing and its related benefits was relatively high among the survey respondents reflects a positive environmental ethic. However, it is important to note that more public awareness and stringent corporate green policy guidelines is needed to transition to a climate-resilient society, especially through training, to engage employees on ways they could help sustain a green growth.

Green computing is a relatively new concept in Nigeria and many developing nations, and as a result, many employees may not be fully aware of the practices and core principles involved. Therefore, it is important for organizations to provide training and awareness programs to their employees to help them understand the benefits of green computing and how

they can contribute to sustainable growth. Through training programs and increasing commitment to corporate social responsibility (CSR) initiatives, employees can learn how to minimize energy consumption, reduce waste, and make eco-friendly choices when using IT equipment. They can also learn about the importance of recycling and proper disposal of E-waste, as well as the benefits of using energy-efficient IT equipment. By engaging employees in training programs, organizations can create a culture of sustainability and encourage employees to take responsibility for their environmental impact. This can lead to an eco-friendlier workplace, reduced energy costs, and a positive reputation as a socially responsible organization. In addition, training programs can help organizations to identify potential barriers to the adoption of green computing practices and develop strategies to overcome them. For example, training can help to address issues such as poor awareness, inadequate financing, and limited access to recycling centres by providing employees with the knowledge and resources needed to implement green computing practices. Organizations should endeavour to develop a sustainable green computing plan, make environmentally sound purchase decisions by purchasing green IT equipment, practice the 3 R's (reduce – reuse – recycle) at every phase of their business from packaging to office supplies, to operations, and supply chains. And invest in renewable energy. Interestingly, few factors were captured in this study as constraint to the adoption of green computing viz: limited knowledge transfer, inadequate finance, limited basic infrastructure (power supply), scarcity of green investors and insufficient recycling centres. Unfortunately, there is no "silver bullet", beyond raising awareness about the importance of green computing and other green solutions, the government should provide the enabling business climate for green policies to be absorbed and thrive to full capacity.

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Author's statements

Contributions

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All the authors of this manuscript confirmed that the data supporting the findings of this study are available on reasonable request.

AI Disclosure

The authors declare that generative AI was not used to assist in writing this manuscript.

Ethical approval declarations

The authors declare that written informed consent was obtained from the participants of the study. All respondents

were adults and voluntarily agreed to participate in the current study.

Additional information

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