

GREEN IT IN THE EDUCATION SECTOR: PROSPECTS, HURDLES AND CASE STUDIES

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ABSTRACT

The growing need for information technology (IT) in education has resulted in higher energy consumption, more electronic waste, and harmful effects on the environment. As schools and universities aim for sustainable methods, Green Information Technology (Green IT) has become an important way to lessen environmental harm while supporting technology. This paper examines the chances and difficulties of using Green IT practices in schools. It points out significant benefits such as better energy efficiency, lower operating costs, increased awareness of environmental issues, and the use of digital learning tools that match sustainability goals. At the same time, the research finds major challenges like budget limits, lack of proper infrastructure, limited understanding among stakeholders, and the need for strong policy guidelines. By reviewing current research and case studies from both advanced and developing countries, the paper offers helpful suggestions for successfully adopting Green IT. The findings highlight the need for careful planning, policy creation, and skill development to promote a sustainable, technology-driven educational setting. Technology has significantly influenced society and its environment in various ways, facilitating the advancement of more sophisticated economies, including the current global economy. Scientific advancements have introduced numerous technologies to society, such as aircraft technology, automobile technology, biotechnology, computer technology, telecommunication technology, internet technology, renewable energy technology, atomic and nuclear technology, nanotechnology, and space technology, all of which have transformed people's lifestyles and enhanced their comfort[1].

KEYWORDS: Challenges, Benefits, Green Education, Green Society, Sustainable.

Introduction

Green Information Technology (Green IT) refers to the approach of designing, implementing, utilizing, and disposing of IT resources in an environmentally responsible manner. Its primary aim is to minimize the ecological impact associated with the production, operation, and disposal of computers, servers, networks, and other IT equipment. Green IT encompasses more than just energy conservation; it addresses all facets of IT life cycle management, including: energy-efficient hardware and software design, sustainable manufacturing practices, optimization of data centers and networks for reduced power consumption, responsible disposal and recycling of electronic waste (e-waste), and the use of virtualization and cloud computing to lessen the need for physical hardware. Green Technology is progressing as a healing solution in today's tech world, aiming to lessen environmental damage while improving people's lives. In general, green inventions seek to stop environmental harm, help society, and make life safer and easier for individuals. It is thought that Green Technology can boost farming output and profits while reducing harm to the environment and saving natural resources. These technologies are used in advanced research in many areas, such as cars, the internet, nuclear energy, computing,

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aerospace, nanotechnology, telecommunications, and space exploration. This sustainable method offers the hope of meeting future human needs[2]. Technology encompasses the field of scientific knowledge focused on the development, application, and utilization of technical methods, as well as their connections to human existence, society, and the environment. It integrates disciplines such as engineering, applied science, pure science, and industrial arts. Numerous technological processes produce undesirable byproducts that contribute to pollution and exhaust natural resources, negatively impacting the Earth's environment. The introduction of new technologies affects societal culture and values, frequently leading to new ethical dilemmas[1].

Literature Review

The growing environmental issues related to increasing carbon emissions, the exhaustion of natural resources, and the rise in landfill waste are receiving heightened focus and dialogue from both public and private sectors (Hilty and Aebischer, 2015). These issues have led to the establishment of agreements in different areas aimed at comprehending the effects on human safety, business practices, technological advancement, and environmental sustainability (Nisha et al., 2013)[3].

The significance of the education sector has been acknowledged in both research and practical applications, particularly in fostering innovation. According to Sovacool et al. (2017), the education sector must not only present new ideas or research but also address the imperative for sustainability.

Consequently, the education sector is viewed as pivotal in embedding sustainability practices, facilitating the generation of ideas, and encouraging participation among students, faculty, and staff to meet the objectives of GIT (Thongmak, 2012).

The higher education system in the Philippines is divided into two categories: private and public universities. Of these, 88 percent, or approximately 1,700 institutions, are private, while only 12 percent, or around 224 institutions, are public (Ricafort, 2009), serving about 3.8 million students. Historically, the Philippine higher education system has faced significant challenges, with a decline in educational quality attributed to several factors, including (a) the availability of qualified and competent faculty, (b) insufficient modern research facilities, and (c) inadequate years of primary education, among others (Chapman and Sarvi, 2017)[3].

Green IT's Components

- **Green Computing:** The creation and application of energy-efficient, environmentally friendly computers and accessories are part of green computing. This includes, among other things, employing low-power CPUs, energy-efficient display technologies, and setting up systems to run in low-power mode when they are idle.
- **Environmentally Friendly Data Centers:** In the IT industry, data centers are among the biggest energy users. Green data centers make use of sophisticated cooling methods, energy-efficient servers, and power management systems to considerably lower energy use and carbon dioxide emissions.
- **Virtualization:** By enabling several virtual machines to operate on a single physical server, virtualization optimizes resource usage and lowers the number of physical devices needed. Not only does this lower energy usage, but it also saves money and space.
- **Cloud Computing:** The demand for physical infrastructure and hardware in specific locations is decreased by cloud computing, which makes use of shared, adaptable computing resources available via the internet. This increases efficiency, scalability, and reduces the overall environmental impact.
- **Management of Electronic Waste:** The responsible disposal, recycling, and refurbishment of old or unused electronic equipment are also part of green IT. Good e-waste management promotes a circular economy in the IT industry and stops hazardous materials from contaminating the environment[6].

Prospects

- **Decreased Energy Usage** Green IT initiatives emphasize the adoption of energy-efficient hardware and software solutions, leading to a significant reduction in electricity consumption. This not only lowers operational expenses but also helps in minimizing the carbon footprint.

- Financial Benefits the implementation of energy-efficient technologies and practices yields long-term financial advantages. Decreased energy costs, reduced maintenance expenses, and prolonged equipment lifespan contribute to overall cost-effectiveness.
- Environmental Conservation By lessening dependence on non-renewable resources and curtailing electronic waste, Green IT is vital in mitigating environmental pollution. Sustainable disposal and recycling methods prevent harmful materials from contaminating the ecosystem.
- Compliance with Regulations Green IT assists organizations in adhering to both national and international environmental laws and standards, such as ISO 14001. Compliance may also provide access to government incentives and green certifications.
- Commitment to Corporate Social Responsibility (CSR) Embracing Green IT reflects a dedication to environmental sustainability, enhancing the organization's public reputation. This alignment with CSR objectives can foster greater trust among stakeholders and attract environmentally aware students, staff, and partners.

The promotion of innovative thinking within the corporate sector is a notable advantage of Green higher education. This form of education can be integrated with corporate strategies through creative approaches. Additionally, it is characterized as 'Futuristic in nature,' which encompasses the use of contemporary designs and technologies that are environmentally friendly. The academic setting becomes more pleasant and relaxing when infused with nature-inspired modern design and technology. Consequently, students are equipped to contribute to the sustainability of various initiatives within their academic surroundings by applying their theoretical knowledge. Furthermore, Green education is recognized as a comprehensive program, incorporating a wide array of Green features and perspectives. These diverse elements enable students to develop various skills across multiple Green disciplines and subject areas[4].

Hurdles

- Significant Upfront Expenses Transitioning to Green IT frequently necessitates considerable initial investments in energy-efficient hardware, renewable energy sources, and enhanced infrastructure. These expenses can pose a challenge, particularly for educational institutions or small organizations with constrained financial resources.
- Insufficient Awareness a significant barrier is the lack of comprehension among stake holders administrators, IT personnel, and end users—regarding the long-term advantages of Green IT. In the absence of adequate awareness and training, institutions may underestimate sustainable practices and postpone their implementation.
- Outdated Systems Numerous institutions rely on obsolete IT infrastructure that is incompatible with contemporary energy-efficient technologies. The process of upgrading or replacing these legacy systems can be both expensive and technically challenging.
- Policy Deficiencies the lack of explicit governmental or institutional policies, guidelines, and incentives can considerably hinder the adoption of Green IT. Without well-defined frameworks and regulatory backing, sustainability initiatives often lack guidance and accountability.

The higher costs associated with Green products represent a significant challenge for Green higher education. Typically, the implementation of Green products incurs higher expenses yet it is a worthwhile investment for future business success. Organizations must perform a thorough analysis of the return on investment related to the development of Green products. This approach will facilitate the emergence of more specialists and professionals in this domain. Additionally, the limited availability of course offerings and the scarcity of institutions dedicated to Green higher education are notable issues. Well-structured courses are essential for cultivating proficient experts in Green education. Furthermore, the establishment of additional colleges is necessary to enhance the quality of Green higher education. The ambiguous themes surrounding Green education also pose a challenge that requires effective solutions. There is a significant lack of Green awareness among the populace, which must be addressed through primary education, awareness initiatives, and various knowledge-sharing activities; otherwise, this will result in a substantial setback for Green higher education[4].

Recommendation

- **Create Institution-Wide Green IT Policies:** Educational institutions should create well-rounded Green IT strategies and policies that specify sustainability objectives, delineate implementation

procedures, and allocate tasks. These regulations should comply with national environmental legislation and international sustainability criteria.

- **Invest in Training and Awareness Programs:** Education and awareness are essential for the effective adoption of Green IT. To foster comprehension of sustainable IT practices and encourage behavior modification, institutions should provide frequent training, seminars, and workshops for students, faculty, and staff.
- **Create Partnerships between the Public and Private Sectors:** Partnerships with government agencies, NGOs, and companies in the private sector may help obtain finance and technological know-how for the deployment of green technologies. These collaborations can also encourage shared responsibility for sustainability and provide access to creative solutions.
- **Present KPIs and Metrics:** Institutions should establish quantifiable indicators, like energy usage, carbon footprint reduction, and e-waste recycling rates, to track progress and maintain responsibility. Regular monitoring and reporting may aid in assessing efficacy and directing ongoing development[7].

Green IT's Future Potential

The use of green IT is predicted to have a revolutionary impact on the accomplishment of worldwide sustainability objectives across a variety of sectors, including education, business, healthcare, and government. The future potential of Green IT lies in its capacity to foster a sustainable digital ecosystem that strikes a balance between technological progress and environmental accountability.

- **Sector-Wide Expansion:** The uptake of Green IT will spread from major corporations to small companies, educational institutions, and government institutions as understanding of climate change and environmental sustainability increases. The use of sustainable IT practices will become the norm and no longer be optional.
- **Advances in environmentally friendly technologies:** Major improvements will be made in smart energy management systems, energy-efficient software, and eco-friendly hardware. Future innovations may include carbon-neutral data centers, biodegradable materials, and AI-powered devices for maximizing resource use.
- **Integration with Sustainable Campuses and Smart Cities:** Smart city infrastructure and green campus programs will heavily rely on green IT. Technologies like cloud computing, data analytic, and the Internet of Things (IoT) will facilitate intelligent energy use, effective transportation networks, and real-time environmental monitoring.
- **Employment and Research Prospects:** The increasing significance of sustainability in IT will create new academic study areas and career options. Digital sustainability analytic, sustainable IT governance, and green software engineering are among the areas that will become valuable specializations.
- **Contribution to the Objectives of Global Sustainability:** Green IT will make a direct contribution to the UN Sustainable Development Goals (SDGs), especially those related to climate action (SDG 13), responsible consumption (SDG 12), and affordable and clean energy (SDG 7)[4].

Case Studies

Real-world instances of Green IT adoption in schools from various areas are highlighted in this chapter, illustrating both creative and pragmatic strategies for sustainability.

- **The United States' Arizona State University (ASU):** The Campus Metabolism Project is an example of an initiative. The Campus Metabolism project was started at ASU in order to foster sustainability by continuously monitoring energy consumption throughout the campus. The program offers user-friendly data dashboards that monitor energy, heating, cooling, and water use in university facilities. By identifying inefficiencies, involving students and staff, and promoting energy-conscious behavior, this data-driven strategy aids in the discovery process.
- **South Africa's Durban University of Technology (DUT):** Green Campus Initiatives. DUT has implemented a number of Green Campus Initiatives that include students, faculty, and members of the community. These programs prioritize waste reduction, energy efficiency, and the sustainable utilization of resources. In order to raise environmental consciousness and

encourage the responsible use of IT throughout the campus, DUT employs seminars, green policies, and campaigns.

- **In the Philippines, there are several higher education institutions:** Green IT Awareness and Practices. The study, which was carried out at a number of Philippine universities, looked at students' and teachers' knowledge of Green IT and their practices. The results showed that there was little integration of Green IT into the curriculum and that institutions lacked policies that encouraged sustainability. The research suggested integrating Green IT topics into IT and engineering curricula and creating sustainability frameworks that apply across the board.

Conclusion

The literature reviewed has illuminated the Green IT strategy. Several national policies and climate action strategies recognize the significant role of Information and Communication Technology (ICT) in addressing climate change challenges and promoting sustainable outcomes in environmental and socioeconomic domains through institutional practices and strategies. Kenyan universities have initiated efforts to ensure sustainable development. This study intends to investigate the Green IT adoption practices at three universities in the Philippines. Initially, these practices encompass areas such as paperless and digital archiving systems, utilization of resource-efficient IT equipment, responsible disposal of IT waste, recycling and reduction efforts, as well as awareness and education initiatives. These Green IT adoption practices suggest that higher education institutions have commenced their journey towards greening their operations, with responsibilities clearly defined for each initiative. The necessity to rethink curriculum design in university education has emerged, necessitating that all subjects be diverse and relevant to the contemporary environment. A curriculum that accommodates all disciplines must address the challenges faced by people globally.

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