GREEN COMPUTING PRACTICES IN GLOBAL COMPUTING

Janhavi Patil , Prof. Flavia Gonsalves

MCA Student, Mumbai Educational Trust, Bandra, Mumbai, India Assistant
Professor, Mumbai Educational Trust, Bandra, Mumbai, India

ABSTRACT: Green computing practices have gained significant traction in global corporations, as companies recognize the importance of reducing their environmental impact and promoting sustainability in their IT operations. One area of focus is the implementation of energy-efficient infrastructure. Many corporations are investing in data centers and IT infrastructure that prioritize energy efficiency. Through techniques like server virtualization, companies consolidate servers and optimize resource utilization, resulting in reduced power consumption and lower carbon emissions.

KEYWORDS: environmentally, hydroelectric, green computing, energy-efficient, scalability and flexibility.

1. INTRODUCTION

Another prominent trend is the adoption of cloud computing and virtualization technologies. By migrating applications and services to the cloud, organizations can leverage shared infrastructure, leading to higher energy efficiency and a decreased environmental footprint. This approach not only reduces energy consumption but also offers scalability and flexibility to meet varying computing needs.

Renewable energy sources have also become a key component of green computing practices. Global corporations are increasingly sourcing renewable energy to power their data centers and IToperations. Investing in solar, wind, and hydroelectric power, as well as engaging in power purchase agreements with renewable energy providers, helps companies reduce their reliance on fossil fuels and mitigate their carbon footprint.

Corporations are actively pursuing server consolidation and optimization strategies.

Through virtualization and the deployment of energy-efficient hardware, companies are able toreduce the number of physical servers required. This results in lower energy consumption and areduced need for cooling, further contributing to overall energy efficiency.

Efficient data storage and management practices play a crucial role in green computing. Organizations are adopting technologies such as data deduplication, compression, and tiered storage to optimize storage efficiency and reduce power consumption. By minimizing theenvironmental footprint of data centers, companies can achieve significant energy savings.

In terms of responsible disposal, corporations are increasingly focusing on recycling and proper e-waste management. Partnering with certified e-waste recyclers ensures the environmentally responsible handling of obsolete or end-of-life IT equipment. By reducing electronic waste and preventing pollution, corporations contribute to a more sustainable IT ecosystem.

Green procurement policies are being implemented by many corporations to prioritize thepurchase of energy-efficient and environmentally friendly IT equipment. Factors such as energy consumption, product lifespan, recyclability, and compliance with environmental regulations areconsidered when selecting IT vendors and suppliers. This approach promotes the adoption of sustainable technologies and encourages manufacturers to produce greener products.

Employee awareness and engagement are also critical in green computing practices. Corporations are raising awareness

among their workforce regarding energy conservation and

sustainable practices. Training programs and initiatives encourage employees to adopt energy- saving behaviors and utilize power management features on their devices, contributing to overall energy efficiency.

Life cycle assessment (LCA) is gaining prominence as a tool for evaluating the environmental impact of IT operations. By conducting LCAs, corporations identify areas for improvement and make informed decisions regarding technology adoption, upgrades, and disposal strategies. This holistic approach ensures that sustainability considerations are integrated throughout the IT lifecycle.

Finally, green computing practices are often incorporated into corporate social responsibility (CSR) initiatives. Companies set environmental sustainability goals, report on their progress, and seek certifications such as LEED or ISO 14001 to demonstrate their commitment tosustainable IT operations. By aligning their business strategies with environmental sustainability,global corporations contribute to a greener future.

Overall, there is a growing recognition among global corporations of the need to integrate green computing practices into their IT operations. The adoption of energy-efficient infrastructure, cloudcomputing, renewable energy sources, and responsible disposal practices, coupled with employee engagement and green procurement policies, helps corporations reduce their carbon footprint and promote sustainability. Through these efforts, companies strive to create a more environmentally conscious and sustainable IT ecosystem.

2. CHALLENGES FACED BY GLOBAL CORPORATIONS

Global corporations are facing a range of pressing challenges in the realm of green computing. Oneof the primary issues is the surging demand for energy-intensive technologies and data centers. The exponential growth of digital services and the increasing reliance on cloud computing have led to a significant carbon footprint. Despite efforts to implement energy-efficient practices and technologies, the sheer scale of computing power and data storage requirements continues to strain existing infrastructure. As a result, global corporations are grappling with the need to balance expanding digital capabilities with sustainable energy consumption.

Another critical problem faced by global corporations is the management of electronic waste, or e-waste. With the rapid pace of technological advancements, devices become obsolete at an alarming rate, leading to a surge in discarded electronics. The improper disposal of e-waste posessevere environmental risks due to the presence of hazardous materials. Global corporations must establish comprehensive e-waste management strategies that encompass responsible recycling, refurbishment, and proper disposal to mitigate the environmental impact and promote a circular economy approach.

Supply chain complexity poses an additional challenge in the context of green computing. Global corporations often rely on intricate supply chains that span multiple countries andregions. Ensuring supply chain sustainability is essential, particularly with regard to the sourcingof raw materials for electronic devices. The extraction and processing of these materials can leadto environmental degradation, including deforestation, water pollution, and soil erosion. Addressing these challenges requires corporations to collaborate with suppliers, implement sustainable sourcing practices, and support initiatives aimed at responsible mining and material extraction.

Furthermore, global corporations must respond to the growing expectations of stakeholders, including customers, investors, and regulatory bodies. There is a rising demand for environmentally responsible practices, and failure to meet these expectations can result in reputational damage and loss of market share. Corporations face the challenge of aligning their green computing initiatives with stakeholder expectations, demonstrating a genuine commitment to environmental sustainability, and effectively communicating their efforts to the public.

Lastly, technological advancements present a conundrum for global corporations seeking to promote green computing. While emerging technologies, such as artificial intelligence andblockchain, hold great potential for transforming various industries, they often require substantial computational power and energy resources. Striking a balance between technologicalinnovation and sustainability is crucial. Corporations need to evaluate and integrate green computing principles into the design and implementation of new technologies, ensuring that environmental considerations are a central aspect of their innovation strategies.

To overcome these challenges, global corporations are adopting a range of strategies. They are investing in renewable energy sources, such as solar or wind power, to reduce reliance on fossil fuels. Companies are optimizing data center infrastructure to maximize energy efficiency and exploring innovative cooling techniques. Designing products with recyclability and repairability in mind is becoming a priority, along with promoting a circular economy approach. Additionally,collaboration with industry peers, suppliers, and stakeholders is essential to drive sustainable innovation, share best practices, and collectively address the environmental impact of global computing operations.

Background and Related work: **Refer** https://rengj.mosuljournals.com/article_177763.html**for writing this part**

3. GREEN COMPUTING PRACTICES

Green computing practices encompass various concepts and mechanisms that aim to reduce the environmental impact of information technology (IT) operations. One fundamental concept is energy efficiency, which focuses on minimizing the energy consumed by IT systems and infrastructure while maximizing their performance. Energy-efficient practices include server consolidation, virtualization, power management features, and efficient cooling techniques. By optimizing energy usage, organizations can significantly reduce their carbon footprint and energy costs.

Virtualization is another key mechanism in green computing. It involves creating virtual instances of servers, storage, and other IT resources. By consolidating multiple virtual servers onto a single physical server, organizations can improve resource utilization and reduce energy consumption. Virtualization also enables better scalability, flexibility, and disaster recoverycapabilities, further enhancing the efficiency and sustainability of IT operations.

Cloud computing plays a significant role in green computing practices. By leveraging cloud services, companies can access shared infrastructure and applications on-demand, eliminating the need for extensive on-premises hardware. This results in energy savings and reducesenvironmental impact. Cloud providers can optimize resource utilization and achieve economies of scale, leading to energy-efficient IT operations.

Renewable energy sources are crucial in green computing. Organizations are increasinglysourcing renewable energy, such as solar, wind, hydroelectric, and geothermal power, to power their data centers and IT operations. By shifting to clean energy sources, companies reduce their reliance on fossil fuels and significantly decrease their carbon emissions. This commitment to renewable energy supports sustainability and contributes to a greener IT infrastructure.

Server consolidation is a mechanism that involves reducing the number of physical servers by consolidating multiple virtual servers onto fewer physical machines. This practice optimizesresource utilization, reduces power consumption, and minimizes the physical footprint of data centers. Techniques like virtualization, containerization, and workload balancing enable efficient server consolidation, further enhancing energy efficiency and sustainability.

Data Center Infrastructure Management (DCIM) encompasses tools and practices for monitoring, managing, and optimizing data center infrastructure. DCIM solutions enable organizations to monitor energy usage, optimize cooling and airflow, and plan capacity effectively. By implementing DCIM practices, companies can enhance energy efficiency, reduce operational costs, and improve the overall sustainability of their data centers.

Power management mechanisms play a vital role in green computing. These mechanisms include power capping, dynamic voltage and frequency scaling (DVFS), and power states (e.g., sleep, hibernate). By dynamically adjusting the power usage of IT devices based on workload demands, organizations can minimize energy waste during periods of low activity, resulting in significant energy savings.

Lifecycle Assessment (LCA) is a method used to evaluate the environmental impact of a product, service, or system throughout its entire lifecycle. In green computing, conducting LCAs helps organizations identify areas for improvement and make informed decisions regarding technology selection, upgrades, and end-of-life management. By considering the environmental implications of IT operations, companies can minimize their carbon footprint and strive for a more sustainable IT ecosystem

Proper e-waste management is crucial for green computing. E-waste refers to electronic waste generated from discarded IT equipment. Responsible e-waste management involves recycling, refurbishment, or proper disposal of obsolete or end-of-life IT assets. This practice reduces the environmental impact of hazardous materials, promotes resource conservation through material recovery, and prevents e-waste from polluting the environment.

Green procurement policies guide the selection and purchase of environmentally friendly IT equipment and services. Organizations consider factors such as energy efficiency, recyclability, compliance with environmental standards, and sustainability practices when choosing vendors andsuppliers. Green procurement promotes the adoption of energy-efficient and eco-friendly technologies, contributing to a more sustainable IT infrastructure.

These concepts and mechanisms collectively form the foundation of green computing practices. By optimizing energy consumption, promoting renewable energy sources, managing e-waste responsibly, and integrating sustainability considerations throughout the IT lifecycle, organizations can reduce their environmental impact.

Methodology for our research:

We conducted a survey for the people who work in different corporations and work in different roles to get a clear picture about their awareness of green computing practices in their own corporation. We included a lot of questions in our survey which directly shows what percentage of people know about the questions related to green computing. Below are the questions and the results we got.
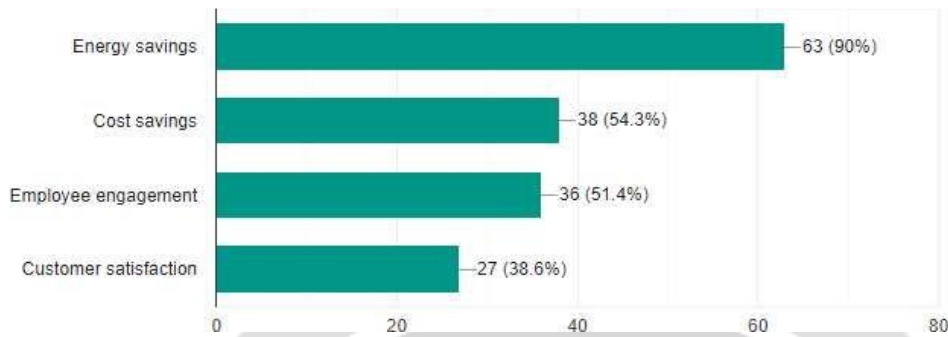
4. RESULTS:

1. Which green computing practices does your company currently implement?

70 responses

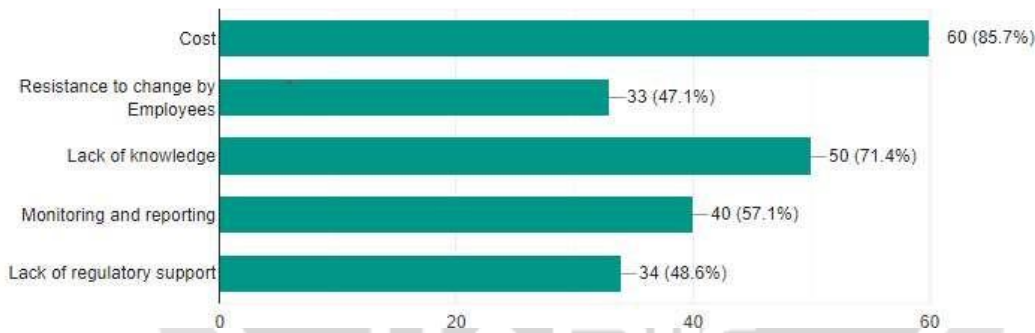| Practice	Responses
Virtualization: Multiple physical servers into virtual servers	27 (38.6%)
Cloud computing	60 (85.7%)
Power management	41 (58.6%)
Recycling and disposal	40 (57.1%)
Sustainable procurement: Sourcing from environmentally...	36 (51.4%)

1. What metrics does your company use to measure the success of green computing initiatives   Copy

70 responses

Metric	Value
Energy savings	63 (90%)
Cost savings	38 (54.3%)
Employee engagement	36 (51.4%)
Customer satisfaction	27 (38.6%)

1. What according to you are the major challenges that organizations typically encounter when implementing green computing practices?   Copy

70 responses

| Challenge	Value
Cost	60 (85.7%)
Resistance to change by Employees	33 (47.1%)
Lack of knowledge	50 (71.4%)
Monitoring and reporting	40 (57.1%)
Lack of regulatory support	34 (48.6%)

4. Which of the following strategies do you believe would be effective in reducing the environmental impact of computing hardware and devices?   Copy

61 responses

Strategy	Value
Recycling and proper disposal	51 (83.6%)
Implementing energy-efficient hardware	55 (90.2%)
Reducing unnecessary consumption	51 (83.6%)

3. What challenges do you think global corporations may face in integrating renewable energy sources into their computing infrastructure?
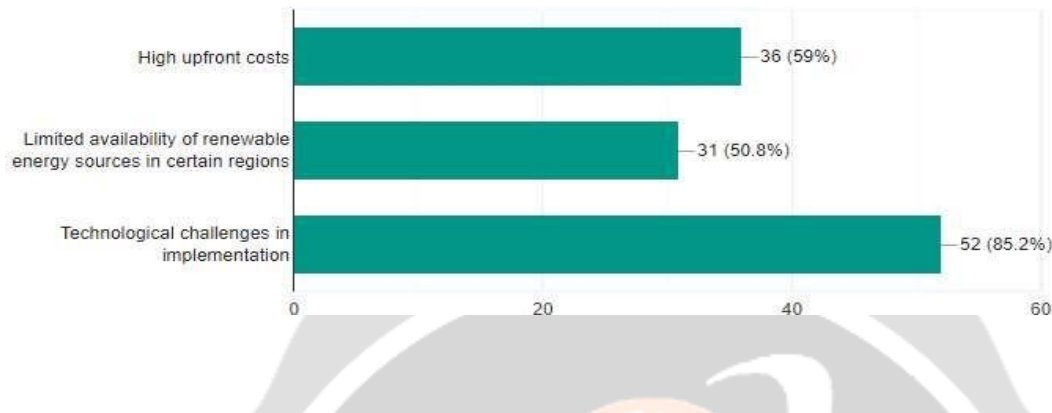
61 responses

2. What benefits do you think global corporations could gain from integrating renewable energy sources into their computing infrastructure?

61 responses

5. CONCLUSION:

In conclusion, green computing practices have become increasingly important for global corporations as they strive to reduce their environmental impact and promote sustainability in their IT operations.

Through concepts and mechanisms such as energy efficiency, virtualization, cloud computing, renewable energy adoption, server consolidation, data center management, power management, life cycle assessment, e-waste management, and green procurement, corporations can optimize energy consumption, minimize waste, and make more sustainable choices throughout the IT lifecycle.

6. REFERENCES:

[1]   Bhattacharya, P., & Sharma, R. R. (Eds.). (2019). Handbook of Research on GreenComputing and Systems. IGI Global.

[2]   Chung, J. Y., & Seo, J. H. (2018). Green computing practices in Korean corporations.Sustainability, 10(8), 2957.

[3]   Islam, S. M. R., & Gani, A. (2021). Green computing: Concepts, paradigms, andpractices. Journal of Network and Computer Applications, 168, 102981.

[4]   Leng, S., & Ehnis, C. D. (2016). Green computing: An overview and practices forsustainable computing. Procedia Computer Science, 83, 894-901.

[5]   Li, J., Yan, W., & Xue, L. (2020). Green computing practices in Chinese enterprises:Empirical evidence and implications. Sustainability, 12(1), 89.

[6]   Lowe, H., & Thakker, D. (Eds.). (2019). Green Computing: Tools and Techniques forSaving Energy, Money, and Resources. CRC Press.

[7]   Pishva, D., & Rasouli, F. (2019). A comprehensive review of green computing practices in industry and academia. International Journal of Advanced Computer Science and Applications, 10(1), 229-241.

[8]   Sushila, & Vijay, R. (2021). Green computing practices in organizations: A systematicliterature review. Journal of Ambient Intelligence and Humanized Computing, 1-