KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF INFORMATION TECHNOLOGY

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DIGITIMES

Green Computing

KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

Vision

To become a globally recognized Institution in Engineering Education, Research and Entrepreneurship.

Mission

M1	Accomplish quality education through improved teaching learning process
M2	Enrich technical skills with state of the art laboratories and facilities
M3	Enhance research and entrepreneurship activities to meet the industrial and societal needs

DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

To produce competent Information Technology Professionals and Entrepreneurs with ethical values to meet the global challenges.

Mission

MD1	Impart quality education with ethical values in Information Technology through improved teaching learning process
MD2	Provide an ambient learning environment using state of the art laboratories and facilities
MD3	Encourage research and entrepreneurship activities to meet the dynamic needs of Information Technology industry and society

Program Educational Objectives (PEOs)

PEO	Key Words	Description
PEO 1	**Core Competency**	Graduates will be successful professionals in career by applying the knowledge of mathematics, science and engineering with appropriate techniques and modern tools.
PEO 2	**Professionalism**	Graduate will exhibit soft skills, professional and ethical values and thrust for continuous learning to maintain professionalism in the IT industries.
PEO 3	**Higher Studies and Entrepreneurship**	Graduates will engage in higher studies and outshine as entrepreneurs through life-long learning which leads to societal benefits.

DIGITIMES

Editorial

We would like to wholeheartedly thank our honorable Chairman, **Lion.Dr.K.S.Rangasamy** and vice chairman **Mr.R.Srinivasan**, and Principal **Dr.M.Venkatesan** for their continuous encouragement and constant support for bringing out the magazine. We profoundly thank our Head of the Department **Dr.P.Meenakshi Devi** for encouraging and motivating us to lead the magazine a successful one right from the beginning. **DIGITIMES** serves as a platform for updating and enhancing upcoming technologies in Information Technology. We are also grateful to all the contributors and faculty coordinator to bring this magazine.

By

Editorial Board

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Introduction

- Green Computing or Green IT is the study and practice of environmentally sustainable computing or IT.
- Green computing is where organizations adopt a policy of ensuring that the setup and operations of information technology produces the minimal carbon footprint.
- Includes "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.

Why Go for Green Computing?

- Today, the main problem of the world is Global warming.
- The atmosphere is becoming hot & is causing many problems to living organisms.
- Computers also play a major role in polluting the world.

How Computing Harm Environment?

- Increase in power, cooling and space for data center.
- According to reports from the German Federal Environment office, devices consume around 17 billion (kWh) in a year in standby mode.

- The CO2 dissipated from 'sleeping' devices=1/7th the CO2 emitted by an automobile.
- Manufactures don not provide a proper shut-off button in devices.
- Windows Vista's default shout down mode is a deep sleep mode that requires power.
- Hazardous material inside computers.
- Cadmium (Damage our kidneys), Mercury (Neurological damage), Lead (disrupt brain neurotransmitters)

Road to Green Computing

- Green Use
- Green Disposal
- Green Design
- Green Manufacturing

By
SUMITHA. J
GOWRI. D
III Year / IT

History

- In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labeling program which is designed to promote and recognize energy efficiency in monitors, climate control equipment, and other technologies.
  - Saved $14 billion in energy costs in 2006 alone.
  - Widespread adoption of sleep mode.
- EPEAT is focused on promoting energy efficient products.

- One of the VIA Technologies' ideas is to reduce the "carbon footprint" of users — the amount of greenhouse gases produced, measured in units of carbon dioxide (CO_2). Greenhouse gases naturally blanket the Earth and are responsible for its more or less stable temperature. An increase in the concentration of the main greenhouse gases — carbon dioxide, methane, nitrous oxide, and fluorocarbons — is believed to be responsible for Earth's increasing temperature, which could lead to severe floods and droughts, rising sea levels, and other environmental effects, affecting both life and the world's economy.

By
GOKULAN. S
II Year / IT

Approaches to Green Computing

i. **Virtualization:**
   - It includes Server virtualization, Consolidation, Storage consolidation & Desktop virtualization.
   - Our typical computer used up to a 250-watt power supply; our thin client uses a 4.8-watt power supply.

ii. **Power management:**
   - Prolong battery life
   - Reduce cooling requirements
   - Reduce noise
   - Reduce operating costs for energy and cooling

iii. **Storage:**
   - Among 3.5" desktop hard drive, 2.5" laptop hard drive and a solid state hard drive (SSD)
   - It consumes less power than other disks.

iv. **Display:**
   - LED displays: use an array of LEDs
   - LCD displays: use a CCF bulb
   - LCD monitors uses 3 times less when active, and 10 times less energy when in sleep mode.
   - LCDs are up to 66% more energy efficient.
   - LCDs are also smaller in size and weight.
   - 21" CRT typically uses more than 120W

v. IT Equipment Recycling:

- If you can extend the working life of your IT products, you reduce the environmental consequences of mining, manufacture, packaging, shipping and disposal.

vi. Product Longevity:

- Gartner maintains that the PC manufacturing process accounts for 70 % of the natural resources used in the life cycle of a PC.
- Another report from Gartner recommends to "Looking for product longevity, including upgradability and modularity."

vii. Remote Conferencing & Telecommuting Strategies:

- Given recent jumps in fuel costs and greater awareness of harm caused by greenhouse gas emissions, many companies wish to reduce travel to cut costs and decrease negative impact on the environment. Remote Collaboration.

viii. Operating System Support:

- Windows 7 includes refinements for more efficient user of operating system timers, processor power management, and display panel brightness.
- Linux Os utilizing fewer resources than other os, and also have a better power management facility.

By
THANEESWARAN Y.G.
SRIRAM.S
II Year / IT

Simple Tasks for Go Green

- Buy and use a low power desktop or a laptop computer (40-90 watts) rather a higher power desktop (e.g. 300 watts).
- Thin clients can use only 4 to 8 watts of power at the desktop as the processing is done by a server.
- Buy hardware from manufacturers that have a hardware recycling scheme, and recycle your old computer equipment rather than sending it to landfill.
- Turn your computer and monitor off when you are not using it.
- Enable hibernation using the power management settings. Standby does not save as much power.
- Replace your CRT screen with an LCD screen.
- Save Your Paper!
- Green Print Saves Too!
- Use Linux (such as Ubuntu), which requires less resources than many other operating systems on an older computer as a spare or a file server.
- Use blade servers instead of rack or standalone servers to reduce power consumption.

By
VIMALRAJ.G
II Year / IT

Green IT beliefs and Pro-environmental IT Practices among IT professionals

Purpose:

The purpose of this article is to analyze the beliefs and attitudinal factors that affect the private sphere pro-environmental behavior of information technology (IT) professionals in using personal computers.

Design / methodology/approach:

A research framework that draws from the belief-action-outcome (BAO) framework and that consisted of 11 hypotheses was developed. Data were collected from a sample of 322 IT professionals and an0alyzed using structural equation modeling.

Findings:

The results identify the pro-environmental personal computing actions that IT professionals are taking and how their Green IT beliefs, attitudes, information acquisition capability, and organizational fields influence their behavior.

Research limitations/implications:

The sample was limited to Australian respondents. The measurement of IT-specific environmental practices was not exhaustive nor was the measures of macro- and micro-antecedents of Green IT belief and attitude.

By
BALAJI S
IV Year / IT

Green IT Practices

Green computing aims to attain economic viability and improve the way computing devices are used. Green IT practices include the development of environmentally sustainable production practices, energy-efficient computers and improved disposal and recycling procedures.

- **Green Use:** Minimizing the electricity consumption of computers and their peripheral devices and using them in an eco-friendly manner
- **Green Disposal:** Repurposing existing equipment or appropriately disposing of, or recycling, unwanted electronic equipment
- **Green Design:** Designing energy-efficient computers, servers, printers, projectors and other digital devices
- **Green Manufacturing:** Minimizing waste during the manufacturing of computers and other subsystems to reduce the environmental impact of these activities.

By
DHANUSYADEVI S
IV Year / IT

Green Disposal

Reuse:

Donate your computer components to people who may not have or have lesser quality computers.

Reduce:

Rather than discarding your computer upgrades it. Change it some of the parts in order to make it new.

Recycle:

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit board contain such precious metals as gold, silver, platinum , etc. and such base metals as copper, silver, aluminum

By
DENMOZHI S
IV Year / IT

Guidelines for Green Computing

- ✓ Power-down the CPU and all peripherals during extended periods of inactivity.
- ✓ Try to do computer-related tasks during contiguous, intensive blocks of time, leaving hardware off at other times.
- ✓ Power-up and power-down energy-intensive peripherals such as laser printers according to need.
- ✓ Use liquid-crystal-display (LCD) monitors rather than cathode-ray-tube (CRT) monitors.
- ✓ Use notebook computers rather than desktop computers whenever possible.
- ✓ Use the power-management features to turn off hard drives and displays after several minutes of inactivity.
- ✓ Minimize the use of paper and properly recycle waste paper.
- ✓ Dispose of e-waste according to federal, state and local regulations.
- ✓ Employ alternative energy sources for computing workstations, servers, networks and data centers.

By
ELANGOVAN P
IV Year / IT

How green computing conserves power?

Green computing, also called green technology, is the environmentally responsible use of computers and related resources. Such practices include the implementation of energy-efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste).

ENERGY STAR server consumed 54% less power than older model servers. Servers that earn the ENERGY STAR will, on average, be about 30% more energy-efficient than standard servers. In addition to using less energy themselves, ENERGY STAR-qualified servers substantially reduce cooling loads in data centers. A general rule of thumb suggests that one watt saved by a server has the added benefit of saving one to two watts of cooling power. It's important to note that these power savings come with a substantial increase in performance - at 50% utilization.

By
ELANKANEI M
IV Year / IT

Green Computing – why?

Leaving the computer on when not in use (CPU and fan consume power, screen savers consume power)

- **Insufficient Power and Cooling Capacities**
  Data centers have insufficient cooling capacities.
- **Pollution**
  1. Manufacturing techniques
  2. Packaging
  3. Disposal of computers and components
- **Toxicity**
  There are toxic chemicals used in the manufacturing of Computers and components which can enter the food chain and water!

Three areas of focus

- **Purchase/Disposal**

  Responsible computer purchase and disposal considerations.

- **Energy use**

  Energy use and efficient ways to computing.

- **Reducing waste**

  Using computers to reduce the use of natural resources.

By
DHARANI P
IV Year / IT

Pros and Cons of Green Computing

Pros:

1. Green computing technique reduces the energy consumption which results into low carbon dioxide emission.
2. By using green computing techniques we can also save money that was spent in extra usage of energy and resources.
3. Green computing also applies changing government policy to encourage recycling.
4. Green computing also removes the risk which is existing in the laptop such as chemical known to cause cancer or nerve damage etc.
5. Use preserves resources which use less energy to produce use and disposes of product.

Cons:

1. Green computing quite costly.
2. Some computers which are green may be considered as underpowered.
3. Fast technology change.

By
MOHANRAJ S
III Year / IT

Distinctive Features of Green Computing

Let's now take a look at green computer features–which will help you in determining whether the computer you're buying is truly green or not. Most computer manufacturers have introduced a series of green PCs, but do investigate the following features to ascertain how green their computers are.

Low Use of Hazardous Elements:

A lot of hazardous substances are used in the production of a computer ranging from the more lethal ones like cadmium, lead, chromium, and mercury to the relatively less hazardous ones like flame retardants, pesticides, and chlorinated plastics. As for the less hazardous substances, the focus is on reduction of their use, since their elimination may not be completely possible.

Energy Efficient:

That's one feature of green computers that pleases not just environmental enthusiasts but also the budget-conscious buyer. Every green computer will have an energy star rating on it, and the more the stars the more energy efficient the computer will be. Some green computers are also available with the option of running them on renewable energy like solar energy, for which the manufacturers will supply you with all the required accessories.

Recycled Materials Used for Manufacturing:

A truly green computer will have most of its components, especially the plastic ones, made of recycled materials. And the manufacturers are required to declare what percentage of material used in the production of the computer is recycled, with minimum thresholds specified at 10 percent. However, it's more environmentally friendly to opt for a computer that's built with more than 25 percent of recycled material. Ideally, printed circuit boards are the only things that may not contain recycled material.

End of Life Recovery:

The green computers are designed in such a way that at the end of their life their components can be easily reused, disassembled, or recycled. A minimum of 65% of the parts of the computer should be recyclable or reusable. Apparently, some of the better brands of green computers guarantee a minimum of 90% reusable or recyclable parts. Also, the parts that are hazardous should be marked accordingly for easy identification and expert handling.

By
AHAMED FAIZAL H
VINOTH M
III Year / IT

Green Computing - Technology Services

What Technology Services is Doing to Go Green

Technology Services (TS) supports sustainability in several ways. Examples include:

- Purchasing from Environmentally Committed Companies
- Participating in Electronic Recycling Programs
- Deploying Virtual Technologies
- Limiting Printing and Recycling Paper

Purchasing from Environmentally Committed Companies

Responsible handling of electronic equipment is critical in order to minimize the university's impact on the environment. TS purchases campus computers from Dell and Apple. Both companies are known for adhering to sustainable, environmentally responsible practices and standards which apply for the life of their computers, from design, production, and packaging to recycling after the machine's useful life has ended.

Dell, Inc.

Dell vigorously upholds the highest standards for corporate environmental responsibility. To that end, Dell supported a multi-stakeholder group in developing the Electronics Products Environmental Assessment Tool (EPEAT). All Dell computers purchased by the university meet the EPEAT standard (most at the Gold level, a few at the Silver or Bronze levels).

Dell also banned the export of their electronic waste to developing nations. They offer a strong trade-in program for used equipment. Dell focuses in every way on being environmentally and ethically responsible corporate stewards.

Apple, Inc.

Apple focuses on a comprehensive strategy for their machines, with specific goals for each phase of product development, use, and disposal. Every computer Apple sells has earned the highest rating of EPEAT Gold.

Participating in Electronic Recycling Programs

All electronic waste on the Puget Sound campus is recycled in one of the following ways:

1. Outdated Apple equipment is processed through Apple's Trade-In Program, often for purchase credit. Apple either refurbishes the equipment or recycles it in an environmentally safe manner.
2. Other outdated equipment is processed through the university's recycling partner, GreenPC Electronic Recycling. Such equipment is then refurbished and resold to other users.

GreenPC Electronic Recycling is a certified member of the State of Washington's E-Cycle Washington Program, which has strict requirements regarding disposal of electronic waste as outlined in state code. The state also maintains a list of approved e-waste collectors.

Deploying Virtual Technologies

By employing virtualization technology for servers and desktops, Technology Services promotes sustainability while also improving services! Just one virtual server can host services that once required multiple machines, thus reducing the power needed to run and cool the university's physical servers.

Limiting Printing and Recycling Paper

Through PrintGreen, instituted in Fall 2012, students were allotted 750 free prints each semester - an amount that the majority of students did not exceed based on past usage records. Now, as of Fall 2017, students are allotted 2250 print credits for the entire academic year including summer semester. After 2250 prints, a student pays 10 cents per print. The ultimate goal of PrintGreen is to provide students with better information on the environmental impact of their printing and to promote the sustainable use of campus resources. TS works to provide venues which allow many paper-based activities to move online, including:

- Moodle – a course management system where faculty can share electronic documents with students
- SoundNet – the campus Intranet provides a community space for online collaboration and document sharing
- MyPugetSound – the university's move to an integrated software solution greatly reduces reliance on paper for numerous processes across campus

Recycling bins are placed prominently in all computing labs, Print & Copy Services, and TS offices.

What You Can Do

Follow these ten tips for going green at your computer:

- **Look for the ENERGY STAR**
  Consider energy efficiency when shopping for new equipment by looking for products with an Energy Star.
- **Turn Off Your Monitor**
  Your monitor uses a lot of power, so put it in standby or turn it off when not in use.
- **Use an LCD Monitor**
  LCDs are much more energy efficient than the older CRT monitors.
- **Adjust the Brightness**
  The brightest setting on a monitor consumes twice the power used by the dimmest setting.
- **Don't Use a Screen Saver**
  Screen savers consume power and are unnecessary. Instead set your monitor to go blank or dim when not in use.
- **Turn Off Peripherals**
  When you don't need your speakers, scanner, and other add-ons, turn them off.
- **Leave Your Printer Off**
  A printer draws a lot of power, so leave it off until you need it.

Also make sure its power settings include a standby mode that consumes less energy when on.

- **Preview Before You Print**

  Select and print only the content you need. Omit unneeded pages from the printing job.

- **Print on Both Sides**

  Another way to reduce the amount of paper you use is to print multiple pages on a single sheet.

- **Don't Print**

  Ask yourself if printing is necessary. Do you really need a hard copy or can you just read the e-mail, document, or Web page on screen?

By
VIGNESH
STEPHENRAJ
III Year / IT

Approaches to Green Computing on Campus

1. Reducing Energy Consumption
2. Power Management
3. E-mail
4. Online Arrangements
5. Learning
6. Telecommuting
7. Desktop Web (or Video) Conferencing

- Power management is built into PC operating systems, but users have additional choices, such as whether to turn off computers when not in use.
- E-mail can take the place of more costly practices, such as when users distribute print documents as e-mail file attachments rather than as paper copies.
- Online learning using learning management systems and web/videoconferencing can reduce the need for traditional classrooms and other infrastructure while decreasing travel costs and CO2 emissions.
- These energy and cost-saving measures can dramatically diminish carbon footprints and corresponding costs for institutions of higher education.

1. Reducing Energy Consumption

Efforts to reduce the energy consumption associated with personal computers are often referred to as "green computing," which is the practice of using computing resources efficiently and in an environmentally sensitive manner. Many institutions have chosen to include information on their websites about green computing efforts and how to reduce carbon footprints, including University of Texas at Arlington, University of Colorado at Boulder, Cornell University, University of San Francisco, University of Miami School of Medicine, and Mount Holyoke College

Turn off and unplug campus computers from the UnPlug It! section of the recycling program at Columbia College Chicago.

2. Power Management

The U.S. Department of Energy estimates that a personal computer wastes up to 400 kilowatt-hours of electricity a year by functioning at full power even though it is not being used,4 which may represent $50 or more per computer (not including the monitor and other attached peripheral devices) in unnecessary expense, depending on the specific computer, how much it is used, energy prices, etc. To address such waste, sometimes the simplest, most common-sense solutions are the most effective. For instance, computers and peripherals can be turned off when not in use. In an e-mail memo to the Buffalo State College community in summer 2009, faculty and staff were advised that:

"Computing and Technology Services will start powering on all faculty/staff workstations at 4:00AM to deploy software updates to the campus. Workstations will be left powered down on weekends. It is recommended that you shut down your computer at the end of every work day, rather than simply logging off. The college could realize a significant energy (and cost) savings if the majority of campus workstations were powered down for the 12–16 hours per day that they are inactive."

3. E-mail

The use of e-mail continues to explode. I sent over 400 personal and business-related e-mails in one month recently, and that is a small fraction of the e-mails I receive and of the estimated several hundred billion e-mails that users worldwide send daily. The good news is that e-mail can be considered "green" because it reduces paper use when used to distribute documents electronically, thus shrinking carbon footprints and costs.

4. Online Arrangements

Moving different academic and administrative functions online can also reduce an IHE's carbon footprint and energy costs. Each institution must choose the online initiatives that best suit its mission and campus culture.

5. Learning

The popularity of online learning in U.S. institutions of higher education has been steadily increasing steadily in recent years. According to the annual Sloan-C reports, there were 1.6 million college students studying online in fall 2002. Those numbers have increased each year, with over 1.9 million online students in the fall of 2003, 2.35 million in 2004, nearly 3.2 million in 2005, almost 3.5 million students in fall 2006, and over 3.9 million students in fall 2007. This trend has an environmental benefit, as well.

6. Telecommuting

Since 2001 the federal government has required its agencies to have a formal policy to let eligible workers telecommute. The U.S. Patent and Trademark Office has a "hoteling" program that lets its examiners work from home except for at least one hour a week when they need to go to a government office. At the Trademark Office, 85 percent of examiners work from home full time, except for the mandated once-a-week check-in.

7. Desktop Web (or Video) Conferencing

An an era of increasing use of asynchronous education, training, and communication, there also is a continuing need for synchronous training and communication. No-cost or low-cost alternatives to face-to-face meetings and teaching are increasingly available. Desktop web (or video) conferencing can reduce the travel needed for student office visits, staff and faculty meetings, and class sessions. Web conferencing applications allow instructors to teach face-to-face classes with audio and video to and from off-campus locations. Also, users can employ web conferencing to conduct face-to-face meetings from desktop or laptop computers with people at remote locations.

By
OVIYA A
III Year / IT

Impacts of Green Computing

With challenges such climate change and the heavy consumption of non-renewable energy resources, business and individuals have understood the need for adopting green computing standards and have shown the eagerness to contribute to it.

In addition to this, governments and organizations across the world have also taken steps to increase awareness in this matter. The U.S. Environmental Protection Agency's Green IT unit stresses e-cycling and refurbishment of electronic products. Likewise, there are several organizations too that certify green computing practices such as CompTIA, the Green Computing Initiative, the Information Systems Examination Board, the Green Grid and Green500.

As such, many business organizations have also resorted to achieving green computing standards as it boosts their image. These companies often have departments that are devoted to cutting energy consumption and carbon emissions. IT systems often make up to 30 percent of a company's electricity bills, and many companies have started to improve on them. They regularly review their bills, calculate their carbon footprint and focus on their reduction to achieve better standards.

By
JOTHEESWARAN R
II Year / IT

Green Computing in IT Sectors

Computers seem so clean, don't they, just sitting there and humming, without any noxious emissions? But of course computers need power, and right now most of our power comes from fossil fuels. Computers and IT are now a small but rapidly growing source of carbon — about 2% of global emissions, a figure that could easily double within a decade.

That's where green IT comes in. Whether it's more energy-efficient laptops and server farms, or software that automatically powers down our desktops when they're not being used, there are ways to curb the IT sector's energy hunger ways without losing performance. Software like Granola, for example, can run in the background of your operating system and tune up your computer's own energy-saving hardware, ensuring you're not wasting volts unnecessarily. There's no reason you can't get all the computing power you need without wasting power.

By
VENKATESHWARAN S
II Year / IT

Green Computing in Health Care Center

In recent years, Personal Health Record (PHR) has emerged as a patient-centric model of health information exchange. A PHR service allows a patient to create, manage, and control her personal health data in one place through the web, which has made the storage, retrieval, and sharing of the medical information more efficient.

Health care IT sector spending in India is currently localized according to user population; for example, more than 60 percent of spending on servers and software. However, many fossil fuel and material resources are located in rural areas, which have fewer than 20 percent of computing users and accounts for less than 25% of IT spending in India. Building up India's National cloud computing infrastructure over the next several decades.

Currently The Aadhaar database which eventually contains details of every Indian citizen, an individual identity is defined in terms of demographic attributes is name, gender, age and address. But demographic data alone cannot guarantee uniqueness. Unique Identity is possible by linking demographic attributes with bio-metric

attributes like fingerprint and iris patterns of the individual, so no need to create new users data's.

By
SATHAM
JOSHUA DANIEL
II Year / IT

Green Computing in Networking

- The relatively new research field of green computing pursues energy conservation not just as a commercial advantage, (longer battery life, less weight), but as an environmental goal in itself.
- The proliferation of sensors—smart meters, motion detectors, infrastructure monitors—and the enormous amount of data they produce have created big opportunities to reduce energy waste.

- One set of research projects in this area helps utilities better match businesses and households with energy-saving programs by using smart meter data to segment customers based on consumption patterns. Another project develops inexpensive wind sensors and software to better integrate wind power.
- A third advances wireless technology, including channel modeling, multi-user communications, signal processing and system design for use in smart grids, automated highways and intelligent home electronics.
- Other research topics include learning algorithms for electricity-network forecasting and scheduling, and decentralized message passing to continuously optimize a large network of distributed electricity sources and sinks.

By
KALIDASS R
SATHISH KUMAR V
SANTHOSHBALAJI S N
II Year / IT

Real Time Application of Green Computing

Introduction

In many cases, technology projects can be at odds with environmental interests. Technology can create a lot of waste, in device manufacture and energy use, and the increasing pace of innovation may only worsen these environmental issues. But there are a number of areas where this problem is seen as an opportunity, and technology is being used in the battle to protect our environment. Here are 5 examples of technology being used to powerful effect.

Connected Lighting and Heating

- Technology is moving toward a state in which all of our devices are connected, creating an internet of things.
- We are currently in the first wave of these devices reaching the mainstream, and this trend seems poised to continue.
- Within this first wave are a number of devices that allow for greater control over the physical environment.
- For example, the Nest smart thermostat has redefined the task of home heating and cooling, allowing for control over the web, and automated optimization to reduce energy usage.
- A number of startups have launched connected lighting products, using LED technology in an incandescent form factor with wireless connectivity. These lights can be

controlled from a mobile application, allowing users to reduce energy consumption by ensuring the lights are off even after they leave the home.

Electric Vehicles

- Electric vehicles have become a mainstream notion in recent years, driven by the popularity of Toyota's hybrid.
- Public demand for more electric car options has motivated a number of small, innovative startups to enter the automotive fray, despite huge capital and regulatory barriers to entry.

Server Technology

- For many of the technology giants, one of the biggest costs they face is in maintaining data centers.
- For a company like Google, organizing the world's information comes at the high cost of running some of the largest, most sophisticated data centers in the world. Energy use is one of their biggest operating expenses for many of these companies.
- For many of the technology giants, one of the biggest costs they face is in maintaining data centers.
- Google is incredibly active in creating efficient data centers, maintaining tight control of all their operation.
- In fact, this is arguably one of Google's core business areas. They design and build their own facilities and recycle all of the equipment that leaves their data centers.

- The battle between the tech giants, Google, Apple, and Amazon, is on some level a battle over data centers. All of these companies are striving to create efficient data centers that will house the world's information while minimizing financial and environmental impact.

Alternative Energy

- Both Google and Apple have opened data centers that are either wholly or in part fueled by alternative energy. Google has created an entirely wind-powered data center, and Apple has recently filed for patents for proprietary wind turbine technology. This shows how central energy efficiency is to the goals of these tech firms.

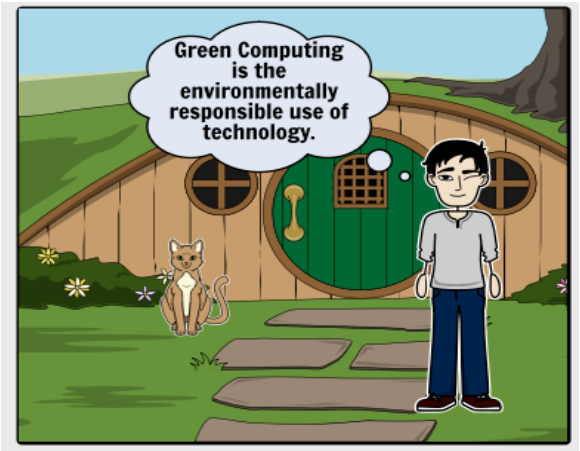
Device Recycling

- Mobile devices and electronics are rarely made in the most environmentally friendly way; their manufacturing processes often involve harmful chemicals and rare metals. With the pace of release schedules for mobile phones increasing, this only spells more trouble for the environment.

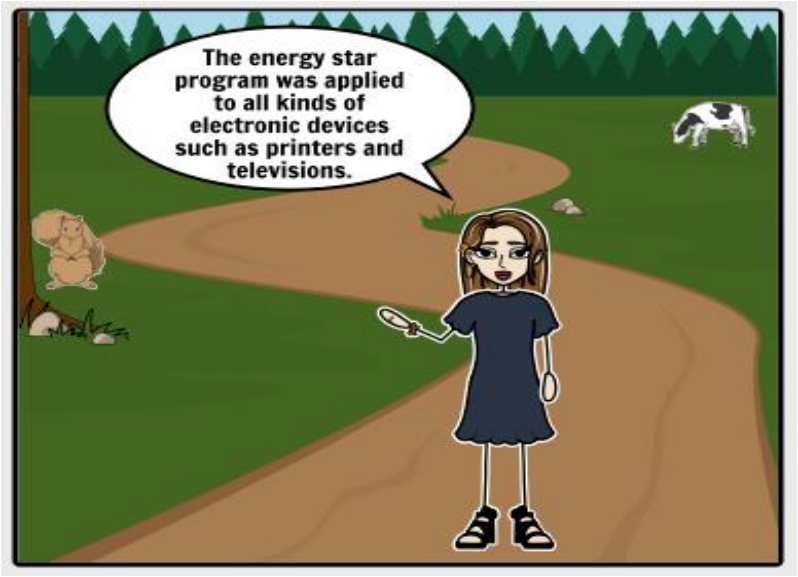
By
SREEMATHI INDRA S
SANDHIYA G
II Year / IT

Regulations and Industry Initiatives

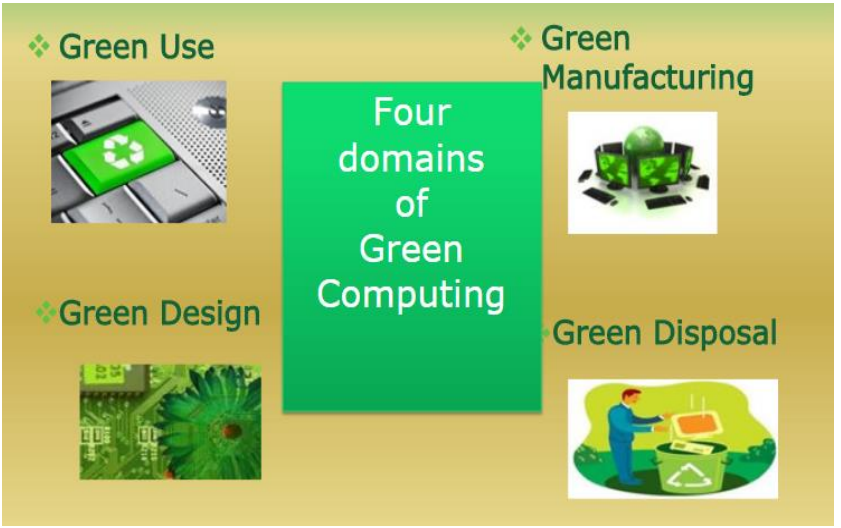
- The Organisation for Economic Co-operation and Development (OECD) has published a survey of over 90 government and industry initiatives on "Green ICTs",
- Modern IT systems rely upon a complicated mix of people, networks, and hardware; as such, a green computing initiative must cover all of these areas as well. A solution may also need to address end user satisfaction, management restructuring, regulatory compliance, and return on investment (ROI).
- Degree and postgraduate programs that provide training in a range of information technology concentrations along with sustainable strategies in an effort to educate students how to build and maintain systems while reducing its harm to the environment.



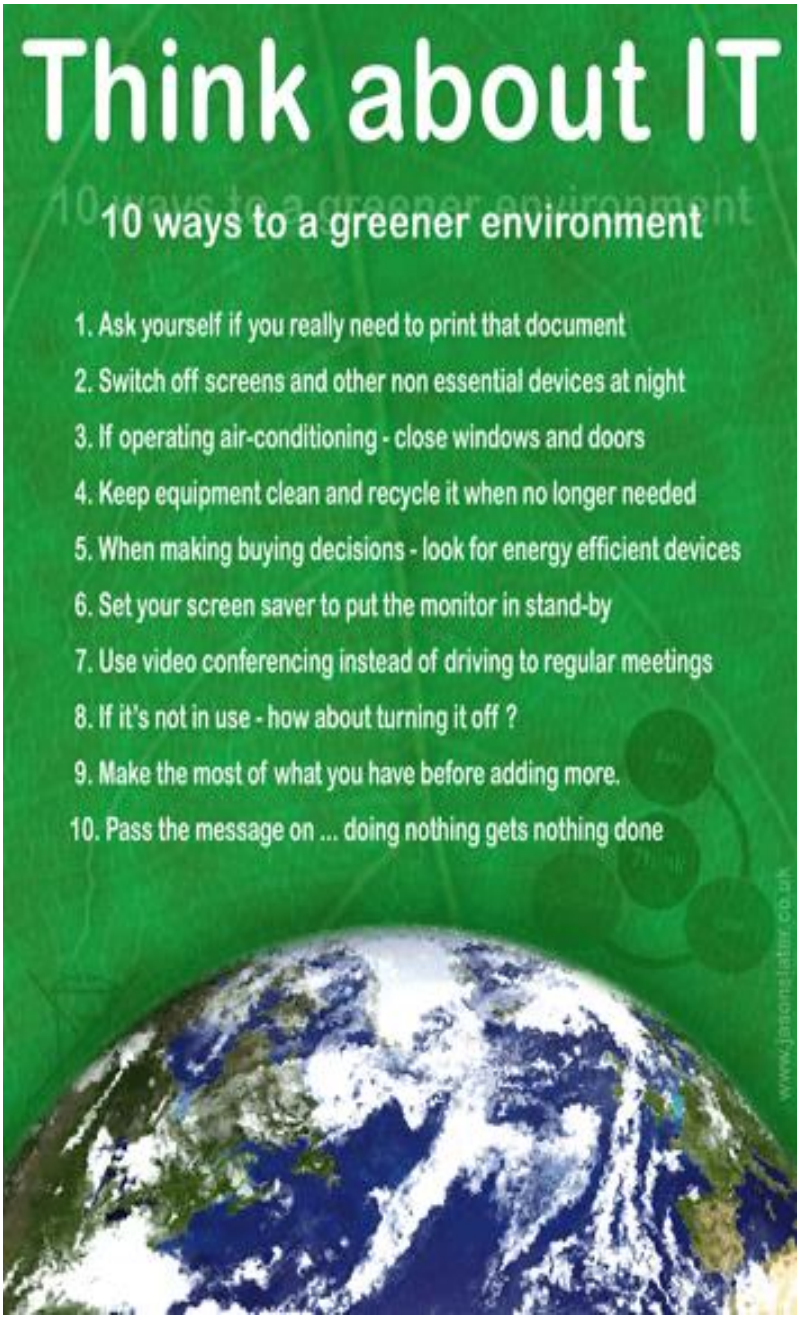
By
Ashok Kumar S
II Year / IT


The energy star program was applied to all kinds of electronic devices such as printers and televisions.


We should have awareness about Green Computing to save our earth .


Green Use
Green Manufacturing
Four domains of Green Computing
Green Design
Green Disposal


Energy Efficient Technology

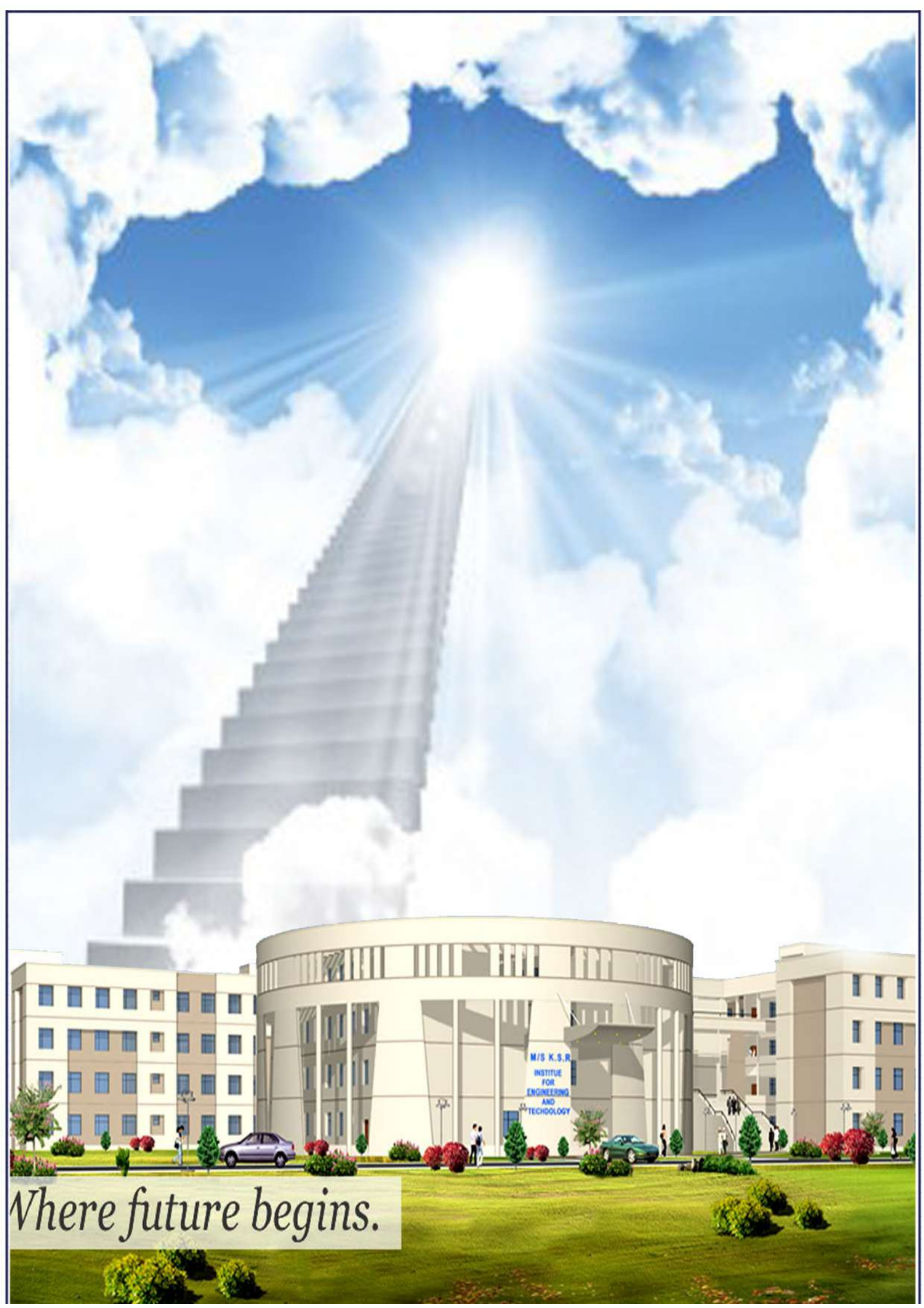

Think about IT
10 ways to a greener environment
1. Ask yourself if you really need to print that document
2. Switch off screens and other non essential devices at night
3. If operating air-conditioning - close windows and doors
4. Keep equipment clean and recycle it when no longer needed
5. When making buying decisions - look for energy efficient devices
6. Set your screen saver to put the monitor in stand-by
7. Use video conferencing instead of driving to regular meetings
8. If it's not in use - how about turning it off ?
9. Make the most of what you have before adding more.
10. Pass the message on ... doing nothing gets nothing done

Program Outcomes (POs)

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the IT enabled solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, analyze and provide solutions to the problems reaching substantiated IT enabled conclusions.
PO3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the desired needs within realistic constraints.
PO4	**Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on engineering activities with the engineering community and with society.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes(PSOs)

PSO1	**Programming Skill**	Work as Software Engineers for providing solutions to real world problems using programming languages and open source software.
PSO2	**Web Designing Skill**	Ability to use the web designing skill to establish new solutions for the societal needs.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INSTITUE
FOR
ENGINEERING
AND
TECHOLOGY
Where future begins.