International Research Journal of Management and Commerce
Vol. 3, Issue 2, Feb 2016 IF- 3.007 ISSN: (2348-9766)
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ELECTRONIC WASTE MANAGEMENT THROUGH ECO-FRIENDLY GREEN COMPUTING

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ABSTRACT

Eco-Friendly green computing is the study and practices of using computing resources in an effective eco-friendly manner. Newly introduced upgraded version, software's & applications in computer consume huge amounts of energy, contributing to high operational costs and carbon emission in the environment. With energy shortages and changes in global climate are the major cause of worry these days, the power consumption of data centers has become a key issue. So, the main aim of Green Computing is to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote recyclability. In

recent past computer manufacturing industry come to realize that going green is in their best interest, both in terms of public relations and reduced costs. This research paper focuses on application of green computing for minimizing overall electronic waste, resources for the betterment of health and environment.

KEY WORDS: Energy, Environment, Green Computing, Health, Recycle.

INTRODUCTION:

New electronic products have become an integral part of our daily lives providing us with more comfort, security, easy and faster acquisition and exchange of information. But on the other hand, it has also led to unrestrained resource consumption and an alarming waste generation. Both developed countries and developing countries like India faces the problem of e-waste management. The rapid growth of technology, up gradation of technical innovations and a high rate of obsolescence in the electronics industry have led to one of the fastest growing waste streams in the world which consist of end of life electrical and electronic equipment products. It comprises a whole range of electrical and electronic items such as refrigerators, washing machines, computers and printers, televisions, mobiles, i-pods, etc., many of which contain toxic materials. Many of the trends in consumption and production processes are unsustainable and pose serious challenge to environment and human health. Optimal and efficient use of natural resources, application of green computing technologies may minimizes global warming, minimize, development of cleaner products and environmentally sustainable recycling and disposal of waste are some of the issues which need to be addressed by all concerned while ensuring the economic growth and enhancing the quality of life.

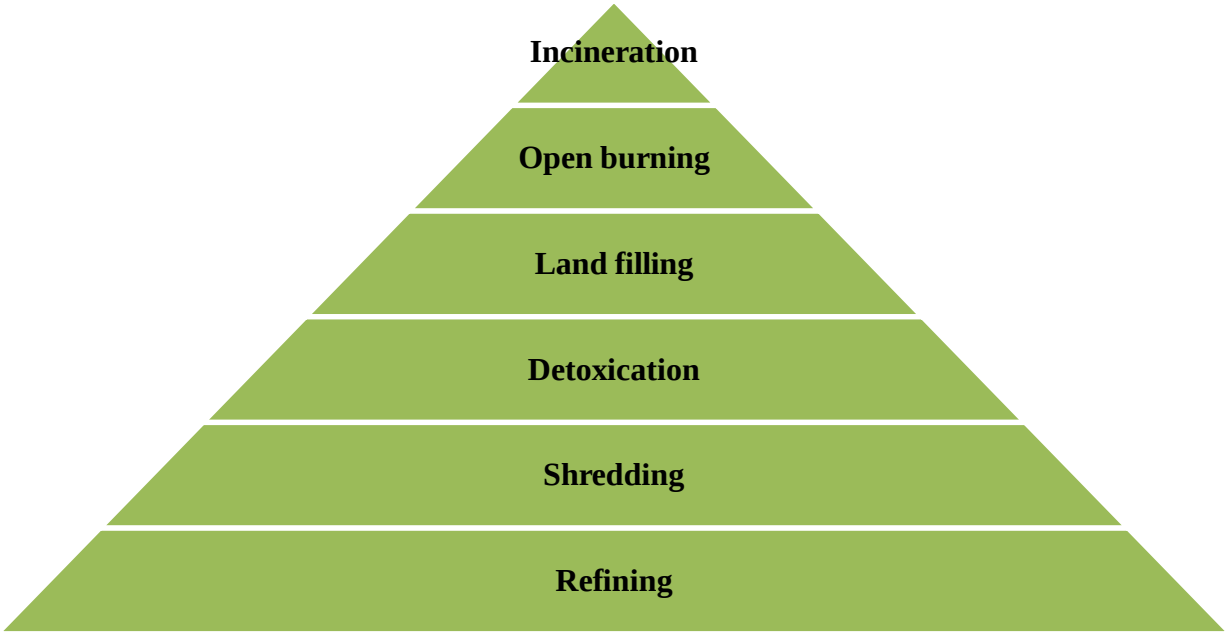
PROBLEM TO BE INVESTIGATED:

Today electronic manufacturing industries are preparing such devices which are however more efficient and accurate but consume more energy and evolve very toxics, dangerous gases and chemicals. Many electronics manufacturing companies especially in computer use lead, mercury, cadmium and other toxics chemicals. All these chemicals are very hazardous in nature and may cause number of health and environmental problems which needs to be taken care of. Green computing may be one of the safest options in minimizing electronic waste in an eco-friendly manner.

ELECTRONIC WASTE RECYCLING TECHNOLOGY:

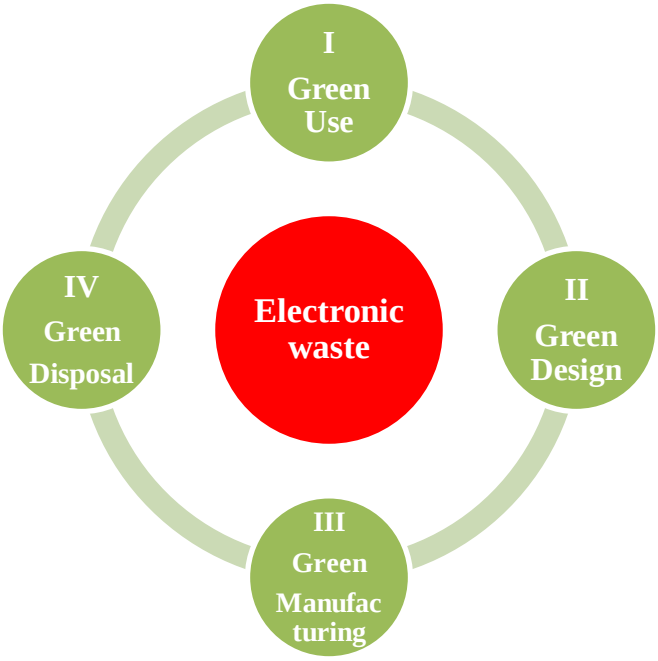
Electronic waste management practices comprises of disposal of electronic waste which is highly toxic in nature and causing health and environmental problems.

Electronic waste management recycling process mainly goes through six steps:



CONCEPT OF GREEN COMPUTING:

Green computing application means efficient and effective use of resources in computing. Green computing application applies with minimizing environmental impact, maximizing economic viability and ensuring social duties. Green computing is very much related to other similar movements like reducing the use of environmentally hazardous materials like CFC's promoting the use of recyclable materials, minimizing use of non-biodegradable components, and encouraging use of sustainable resources**.** A computer manufacture industry worldwide has a direct impact on environment issues, and scientists are conducting numerous studies in order to reduce the negative impact of computing technology on our natural resources. Companies are addressing e-waste by offering take-back recycling programs and other solutions, with lower energy consumption and less wasted hardware.



- Green Use: Green use is the concept of minimizing overall electricity consumption in electronic devices by using it in an eco-friendly manner.
- Green Design: A green design refers to application of energy in a best efficient manner.
- Green Manufacturing: Green manufacturing means minimizing hazardous waste during the manufacturing process.
- Green Disposal: Green disposal relates to recycling of only unwanted electronic items.

REVIEW OF RELATED LITERATURE:

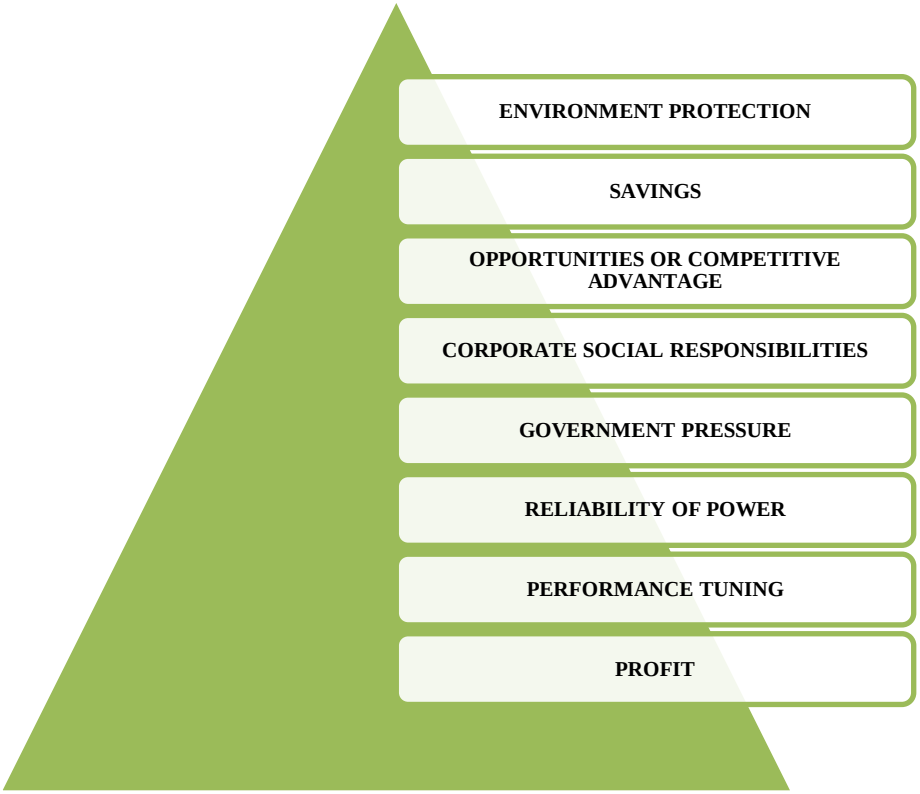
- Today all computer manufacturing companies worldwide are striving very hard to establish cheap, less power consumption and eco-friendly data centers.
- America introduced an energy star program in 1992. Its main aim was given award to those computing products which use minimum energy and give maximum efficiency in its working. Energy star program were included such product as computer monitor, television sets, refrigerator, air conditioning and other electronics devices. All these products may be eco-friendly green computing.
- EPEAT (Electronic Products Environmental Assessment Tool) check the product's standard. All products which are registered are better to protect human health and environment; this item can be easily upgraded and recycled. These products have reduced

the percentage of lead, mercury and cadmium. These products are more efficient in energy and reduce the environmental impact.

- IBM also has also contributed these issues. IBM has helped the clients to purchase the products according to green computing. According to the research of the IBM in 1990, He saved 4.6 billion KWh of electricity and also prevented 3 million metric tones of CO2 emission.
- Google is trying to establish its data centre building on Oregon's Columbia River to tap hydroelectric power.
- Microsoft Company is also trying to establish its data centre building near Washington for hydroelectric financial services company (HSBC) is preparing its building of data centre near Niagra falls for cooling and low energy consumption. In data center the servers evolve a large amount of heat so for their cooling company establish fully air conditioning equipments. The more powerful equipment of servers and then more cooling is required from overheating and secure working accurately. Global companies will spend more energy on data centers on servers than hardware's of the computers. The percentage of CO2 is increasing very quickly.

WHY GOES GREEN COMPUTING?

Computing power consumption of companies has reached a critical point. Despite the huge computing demands, there are many existing technologies and methods by which significant savings can be made. Application of green by organization can reduce their energy footprint while maintaining required levels of computing performance.



ENVIRONMENT PROTECTION:

Researches on environment suggested that CO2 and other emissions are causing global climate and environmental damage. To prevent this application of green computing is a better solution for overall sustainable development.

SAVINGS:

Green Computing can lead to cost savings over time. Reductions in energy costs from electronic component are generating savings for many corporations.

OPPORTUNITIES OR COMPETITIVE ADVANTAGE:

Going green seems to be an opportunity for computer manufacturing organization. It adds a competitive advantages or opportunity over those who do not apply technique of green competing.

CORPORATE SOCIAL RESPONSIBILITIES (CSR):

Now it the prime responsibility of every individuals to perform better for environment protection. Manufacturing product and achieving profit may be the consideration but to maintain social responsibility is also the prime task.

GOVERNMENT PRESSURE:

Right from the prevention of earth day appealing by environmentalist government also applying keen pressure towards manufacturer for application of green technology for sustainable development.

RELIABILITY OF POWER:

As energy demands in the world increases day by day, energy efficient systems helps ensure healthy power systems. Also, more companies are generating more of their own electricity, which further motivates them to keep power consumption low.

PERFORMANCE TUNING:

Performance tuning is the process of adjusting a computer so that it will perform to the best of its ability. Performance tuning and management can also lower the overall energy a given system uses because there are less resource allocated internally for a given software process. Disk I/O, CPU, memory reduction can lead to measurable energy savings.

PROFIT:

Earning extra profit by going green creates extra advantages for the manufacturer those who were not manufacturing green products.

ENERGY CONSERVATION & ENVIRONMENT PROTECTION PROGRAMS:

Many developing countries adopted programs to minimize energy consumption in electronic equipments. The Climate Savers computing initiative is the program launched to reduce power consumption in computers. The Green Electronic Council promotes the manufacturing and sale of Green Computers. The Green Grid is a global consortium promoting the use of energy efficient IT devices in data centers and business firms. The "Green Challenge" is the organization formed to promote energy conservation techniques in the field of Information Technology. The Green Grid is a global consortium promoting the use of energy efficient IT devices in data centers and business firms.

SOME POSSIBLE GREEN REMEDIES:

- Apply a single similar type of hardware to run two or more logical computer systems.

- Application of terminal server to transfer data into a Central server. The central server will process the data .This reduces energy consumption.
- Introduction of Power efficiency system so that the computer and peripherals turn off after a period of time if it is not using.
- Replacement of CRT monitor with LCD or LED monitors.
- Reduction in the uses of toxic chemicals such as lead, cadmium, mercury etc. in computer parts.
- Introduction of recycling programs in all places to dispose obsolete devices easily.
- Promotion of telecommuting systems.

SOME GREEN COMPUTING SOLUTIONS:

- Purchase a small system with minimum attachments and peripherals.
- Turn off the computer immediately after the use. Do not keep it in standby mode. Even in the standby mode, it consumes power.
- Buy a good quality computer with Energy star. Always observe the power consumption.
- Unplug printer, audio system, scanner, modem etc if these are not in use.
- Do not keep the UPS switched on. Switch on the UPS only when the computer is using. If you are using the computer for one or two hours daily, that is enough for charging the battery.

CONCLUSION:

Green computing techniques and issues which were discussed in this paper help us to reduce power consumption and heat which is evolved during processing. Power consumption in computer can be managed such as the sleep mode, hibernate mode, standby mode are very effective in it because computers may be automatically go into low power states, when a

computer is in an idle state without human interest. Techniques such as unplugging a computer, using LCD and using of flash drives may be adopted to reduce energy consumption. Likewise control panel play important role to control the computer as shut down stand by or hibernate. In the future such devices or parts of computer will be designed and manufacture which take very low energy and give out very low heat. Many governments have now tried to take initiative steps in energy management programs like Energy Star. Now it is realized that such standards should be adopted for energy efficient electronic equipments. In USA the United States Environmental Protection Agency and other countries these standards has been adopted and implemented. By using these techniques we can save energy, emission of CO2 , air pollution and toxic materials. Green computing is not about going out but designing new products in this way to reduce energy consumption. Green computing in future will also help in recycling E-waste and scrap computers.

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