

A STUDY OF IMPLEMENTATION OF GREEN MANAGEMENT PRACTICES BY INDIAN IT INDUSTRIES USING MACHINE LEARNING ALGORITHMS

Dr. Priyanka Kulkarni, Assistant Professor
Navsahyadri Group of Institutes
priyanka.ppk@gmail.com

Ms. Mrinal Kulkarni, Student
Modern Law College
mrinal.rajgad@gmail.com

ABSTRACT

Green Management is the buzzword of the time. Mother Earth is the most precious resource and so it is everybody's responsibility to protect it. Green Management initiatives are the outcomes of growing concern about climate change and carbon emission. The IT industry is a service industry that has its own share of causing environmental degradation. The study of sustainability reports of top ranked Indian IT companies considered as the secondary sources of data for this study reveals that Green IT practices are being followed by IT indigenous IT companies. To cross verify the claim, this research paper focuses on gathering and analyzing data from IT professionals to understand the extent of implementation of green management practices by Indian IT companies. The IT companies selected for this study are Tata Consultancy Services, Infosys, Wipro, HCL Technologies Persistent systems and KPIT.

Keywords: Green Management, Green IT, Green Initiatives, Sustainable Practices.

Introduction

The natural environment encompasses several aspects like water quality, air pollution, endangered wildlife, etc. Civilization, industrialization, and growing interference of humans have created many environmental issues. As rightly quoted by Melville, "Environmental issues concern environmentalists, scientists, and national-international regulators. They have also become the center focus of the business world.", Melville (2010) This has given rise to the idea of green business. The idea of green business practices is not new. Its traces are discovered in Ancient Hindu scriptures and economics. *The Atharva Veda* quotes "What of thee I dig out, let that quickly grow over", notes Mehta (1999). It entered into mainstream business literature in the 1990s, as stated by Huetting (1990), Humphrey (2000), Linton (2007). At the end of the 20th century, in the wake of the ever-increasing public concern about the sustainability of economic development, the notion of green business emerged, quotes Rai (2018)

Information technology (IT) though a service industry has its large share in Carbon Di oxide emission. For running computers and servers for an entire day a large amount of electricity is required, which increases CO₂ emission. Micro components needed inside a computer system also release many harmful chemicals while in making. All this leads to increased environmental pollution. Green IT is conducting industrial activities related to the IT industry in a manner that does not harm or damage the environment.

Literature review

Environmental Legislation

Environmental legislation envelops laws and regulations that deal with controlling water pollution and air pollution, and protecting endangered wildlife, and numerous other environmental aspects. Environmental legislation works to normalize human-nature interactions and improve health and wellbeing of all the living species of the Earth. Environmental legislation has a broader scope because the natural environment encompasses quite a lot of facets. So, effective environmental legislation must include everything: the air, the natural resources like water and fossil fuels, and of course the flora and fauna that share this world with us. Environmental Laws guard the use of natural resources and protect the environment. To curb the destructive practices of unscrupulous people, forest mafia groups, poachers, polluters, and over exploitation of environmental resources, effective legislation is necessary.

Following literature discusses environmental legislation and its importance.

Conservation of the environment for sustainable development has become an agenda of national and international importance. Governments have been spending billions of dollars on conservation programs for pollution control and preservation of natural resources, mentions Lee (2005). This is the main reason for environmental legislation to come into force. People and organizations depend on devices like Public Interest

Litigation (PIL) to register their discontent about environmental issues, and this approach has its supporters and additional critics, states Upadhyay (2005).

Governments of many developed and developing nations have implemented environmental laws for environment protection and offer financial assistance on green/ environment-friendly products, writes Yadav (2013). The apex body, the United Nations (UN) along with its various parts and components is striving hard to make the world a better place to live in. This does not only mean economic or monetary development but all-round development of people living in all parts of the world. While achieving this, present generations must keep in mind the well of their future generations. This can be achieved only through sustainable development.

Organs of the United Nations such as UNESCO and UNICEF have introduced a mixture of measures, reforms on all the levels possible to develop and improve regions of the world. Especially those areas where development is not at the expected pace and as a result, the residents are lagging the others. Such areas need some special laws and regulations to help them match pace with the rest of the world. Initiatives in this direction have been introduced by these specialized UN agencies, with special focus on sustainable development. As a response to the changing global needs as well as needs of all countries eventually at various levels of development, the UN has been organizing the Earth Summit or decennial meetings of the world leaders since 1972. The aim was to bring forward the best individuals and organizations from all categories of life and to identify what humanity's most pressing challenges are and to develop a plan of action to solve them. The 2000-2015 Millennium Development Goals and 2015-2030 Global goals are a result of this Earth Summit. One of the millennium development goals is Environmental Sustainability (UN Documentation, 2000).

The main targets to be achieved are one. Integrate the principles of sustainable development into country policies and programs, and two. Reduce Biodiversity loss. One of the turning points for the global view on Environment Protection was the Rio de Janeiro Earth summit of 1992. The Earth summit of 1992 which took place in Brazil was a notable changing point which changed the viewpoint of the international agencies to address the global level Environment problems. The main aim of this summit was the sustainable development of all the resources so that they will not get depleted, and the future generations should be able to use and enjoy them as well. Its notable feature was the adoption of "Agenda 21." "Agenda 21 is a comprehensive plan of action to be taken globally, nationally, and locally by organizations of the UN System, Government, and Major Groups in every area in which human impacts the environment." (Agenda 21). The main objective of Agenda 21 is sustainable growth and development of the world. Other measures include reducing inequality, improving Human development Index (HDI), population control, etc. A World Summit on Sustainable Development (WSSD) was held at Johannesburg, South Africa in 2002. Complete implementation of Agenda 21 and the commitments to Rio principles, were strongly affirmed at the summit. The 2002 Johannesburg World Summit on Sustainable Development was convened to develop sustainable organizations, 10 years after the first Earth summit at Rio de Janeiro. The Johannesburg Declaration was the main outcome of the summit, and several other international agreements were also started after this summit.

Environmental Legislation in India

UNESCO defines sustainable development as, "Sustainable Development is development that meets the needs of present, without compromising the ability of future generations to meet their own needs", The aforementioned commission also adopted 17 Sustainable Development Goals (SDG), covering all the aspects of human life on Earth, which includes as basic human rights as the right to clean and safe drinking water, and right to a healthy and disease-free atmosphere which is every human's fundamental right, to more advanced and privileged rights as quality education, good infrastructure and industries with developed and modern amenities, etc. (UNDP, 2023).

Article 21 of Indian Constitution, grants the citizens of India the right to live and breathe in a safe pollution-free environment. Part IV of Indian constitution contains directive principles that state it as the duty of the state to protect the environment {Article 48-A and Article 51-A (g)} quotes Pal (2018). After independence the law-making authorities, through constant efforts, have produced new developmental ideas which would lead to a steady development at the same time which would not have its toll on the environment and natural resources. 5-year plans were introduced by the Indian government to focus on preventing the degrading quality of the environment. The second Five-year plan (1956- 1961) focused on the environment and natural resources. Today, India is in a progressive state of development. Everywhere new industries are coming up. The goods are being manufactured and transported to places within and outside India. This highlights a growing need for controlling and limiting the amount of damage caused to the environment. The Indian government has passed and amended Environmental legislation repeatedly to meet the requirements of changing times.

The Environment (Protection) Act, 1986 passed by the Indian parliament is one of the notable acts for protection and maintenance of the environment. It empowers the Union government to enact laws to give effect to international agreements signed by countries. This act was passed to implement the decisions taken by the United Nations Conference on Human Environment. It covers all the industrial and infrastructure activities hazardous to the Environment.

Article 48A of the Indian Constitution states that the state shall endeavor to protect and improve the environment. It says that it is the primary and most important duty of the state to protect and prevent the damage of the natural environment within its geographical boundary and the government along with the citizens of the state shall make a combined effort for sustainable growth and development of their area. Article 48A specifies: The states shall endeavor to guard, improve the environment, and protect the country's forests and wild animals. With the aim of living in a healthy environment, The Ministry of Environment was established in 1980. It became the Ministry of Environment and Forests in 1985, later. India being a developing country is the third largest producer of GreenHouse Gases. It is hence facing tremendous pressure from the international community to reduce emissions to less than 5.2%, observes Singh (2018). Designing and implementing Green Management Practices thus becomes utmost important for Indian Industries. The Indian Constitution's 42nd Amendment clause (g) of Article 51A states that it is the fundamental duty of every Indian to protect and improve the natural environment. Every Indian citizen shall protect and take efforts to improve the natural environment, including lakes, forests, wildlife, and rivers, and be concerned about the living things.

Green Business

"Green Business is any business that has minimal negative impact on the environment." write Rai (2018) Speedy exhaustion of natural resources and worsening of environmental quality grew concerns over sustainability of economic development. Green business practices are still far away from being universally embraced and applied by business entities, because of perceptible differences of business penetration by the green ideas in many countries. Several reasons affect this. One of them is the fact that the greening of business is still largely perceived as an extra burden (in terms of cost increase or revenue loss), Mention Rai (2018).

Definitions of Green Business

"A business that has adopted the concept of environmentalism across the various functions of the business is a green business.", Zsolnai (2002) "A green business activity is any activity that is performed in a manner that has either limited negative ecological impact or directly benefits the natural environment in some way.", Gilbert (2007). "A green business requires a balanced commitment to profitability, sustainability and humanity Makeover," Pyke (2009)

"Green Businesses have more sustainable business practices than competitors, benefiting natural systems and helping people live well today and tomorrow while making money and contributing to the economy", Croston (2009). "An establishment that produces green output", Brown, Ratledge (2011). "A "green business" can be defined as an organization that uses renewable resources (environmentally sustainable) and holds itself accountable for the human resource aspect of their activities (socially responsible)", Slovik (2013).

"Green business will also engage in forward-thinking policies for environmental concerns and policies affecting human rights" (Business Dictionary, n.d) The green business definition describes "a company that does not make any negative impact on the environment, the economy, or community." The researchers here propose the definition of green business as,

"A Green Business is a business activity that envisions sustainable development and girt up to use renewable resources and reduce its carbon footprint."

Source Defined by the Researchers

Characteristics of Green Business

The main characteristic of green business practices is.

They utilize the assets to solve current problems without damaging the environment.

They address the issues of the existing without trading off the capacity of future eras to address issues prevalent at their time. (Daly1994)

Another characteristic of green business is it comes under the canopy of sustainable development and gives refuge to a wide variety of corporate, environmental, and social apprehensions aimed at curtailing arms rather than eliminating them altogether (Vachon2008)

Sustainable development commission of the UK gives the definition of sustainable development as follows, “Sustainable development is the development that meets the needs of the present, without compromising the ability of the future generations to meet their needs” (What is sustainable development, 2010)

Need for Green business

The environmental concern is not restricted to developed countries like the USA but developing countries like India are also showing a growing concern about “Going Green.” This is mainly because consumers now-a-days are aware of and concerned about environment related issues and are willing to purchase eco-friendly or green products. (Yadav ,2013) Global warming, shifting seasons, uncertain climatic conditions are all effects of environmental changes. This is affecting human life as well as their co-residents of mother Earth. Endangered wildlife, earthquakes, draughts, floods, desertification are all impacts of ecological imbalance. If timely measures are not taken, future generations will have to pay heavily. Consumers are ready to purchase green products even if they are higher in cost as compared to their non-green counterparts.

Green Business Practices

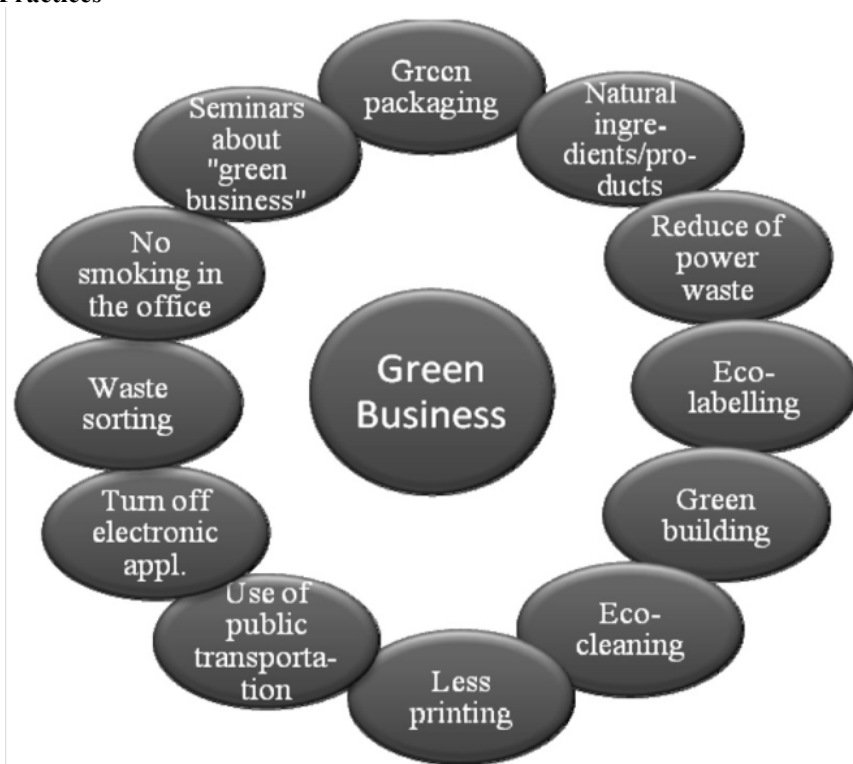


Fig 1 Green Business: Challenges and Practices

Source: Čekanavičius, L., Bazytė, R., & Dičmonaitė, A. (2014). Green business: challenges and practices. *Ekonomika*. researchgate.net

Businesses Can Adopt The Following Practices To Consider Themselves As A Green Business

1. Use eco-friendly material for packaging.
2. Encouraging employees to use bicycles or public transport to the office once or twice a week, states Jayarani (2019)
3. Managing waste by recycling or reusing methods. Segregating waste into biodegradable and non-biodegradable products and disposing accordingly.
4. Using solar lights and having company wide electricity management policy
5. Going paperless while doing day to day activities
6. Planting as many trees as possible and encouraging CSR activities.
7. Using Green Supply Chain Management Practices, suggests Ramarajan (2018)

Green IT

With the fourth Industrial revolution IT has become a crucial part of our lives today. It has exploded in several areas ranging from wearable smart devices to smart homes to smart cities and has improved our lives and work.

While we take the help of IT & AI to make our lives better, we are little aware that IT has been contributing to environmental problems, notes Murugesan (2008)

According to Murugesan (2008), Computers and IT infrastructure require substantial amounts of electricity, which places a heavy burden on electric grids and increases the emission of GreenHouse Gases. Additionally, the hardware parts cause problems during their disposal. E waste disposal is also a growing concern. Following is the list of Environmental Problems created by the IT industry.

1. Hazardous waste is generated while manufacturing computers and their electric and non-electric components.
2. Computer systems including servers and monitors along with data communication equipment and cooling systems consume electricity to a substantial extent.
3. Toxic materials used in computer components cause land and water pollution.
4. Computers and IT systems generate a lot of heat which increases CO2 emission and causes global warming.
5. Computers and other electronic devices use a large amount of electricity generated using fossil fuel.

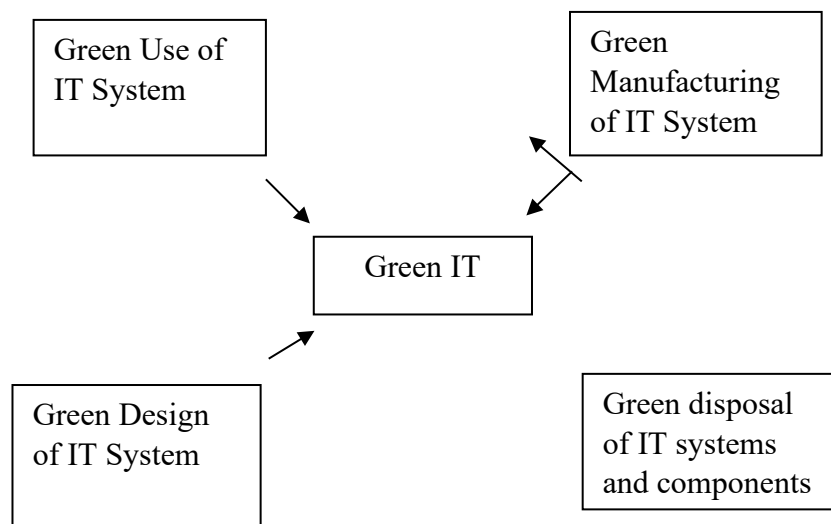


Fig 2: Holistic IT Explained by Murugesan Murugesan, S. (2008). Harnesing Green IT: Principles and Practixces. IT Professional. researchgate.net

- Green Manufacturing is manufacturing IT hardware like computers and other components in a way that causes zero negative impression on the environment.
- Green Design designs computer hardware in an ecofriendly and energy efficient manner.
- Green use refers to the reduction in energy consumption while using servers and computers and using them in eco-friendly ways like virtualization etc.
- Green disposal means responsible disposal of IT hardware and other electronic components.

The Impact of Green Initiatives on Indian IT Industry

Considering these issues IT companies in India have started adapting Green Business practices commonly known as green IT.

The following table shows Green IT Practices followed by Indian IT Organizations

Organization	Green IT Practices
Tata Consultancy Services	TCS uses renewable sources of energy at selected offices. The company also uses star rated energy saving appliances. Preference is given to suppliers who conduct their business in an eco-friendly way. They also strive hard to create awareness among employees & business associates about the environmental issues. The company follows the policy of Reduce, Recycle and Reuse.
Infosys	Every office of the company is certified with EMS (Environmental Management System) certification. They use energy saving appliances which has helped the company reduce its energy consumption by fifty % as compared to last year. The company is now focusing on building energy saving infrastructure.
Wipro	Wipro uses a range of eco-friendly desktops. It has opened various e-waste disposal centers, where the e-waste is collected. Their sustainability report is generated strictly based on GRI framework. They use automated power management systems to achieve power savings.
HCL Technologies	The company ensures disposal of e-waste in an eco-friendly way. The policy of recycling and re-use is followed at the company. The organization has been able to reduce its power consumption in their company owned premises.

Table 1: Ways to Go green.

Source: (Yadav, 2015) researchgate.net

Organization	Green IT Practices
Persistent Systems	The company is resolved to reduce GHG emission by 2030. They are using 100% renewable energy. By 2028 they plan to reduce 80% emission by using green supply chain and reducing business travels. They also have reduced freshwater consumption and focused on wastewater recycling. They are practicing rainwater harvesting in water affected areas.
KPIT Technologies Ltd.	The company focuses on sustainable development by way of reducing air, water, and dust pollution.

Table 2: Ways to go Green

Source: Prepared by the Researcher

Employees' Satisfaction Level about The Implementation of Green Management Practices in Indian IT Sector

The research question attempts to answer the extent to which the IT industry in Pune City has espoused Green IT practices. This paper accepts a qualitative research method to know the level of application of green practices in the IT industry. The research approves a constructivist view (Merriam, 2002), that there can be manifold explanations of green business practices within the IT industry, and the degree to which these practices are followed will appear through the communications with personalities and companies within this industry.

Research Methodology

Objectives of the study:

- To study the Environmental Legislation in India
- To study the impact of green initiatives on the functioning of the Indian IT Industry.
- To find out employees' satisfaction level about the implementation of Green Management Practices in the Indian IT sector

The sampling technique used is Random Sampling.

Sample Size: Top Management professionals 6 & People employed in Indian IT companies 500

For this survey, the researcher surveyed five hundred respondents employed at Indian IT companies like TCS, Wipro, Infosys, HCL Technologies, Persistent systems and KPIT technologies ltd., located in and around Pune city. The publicly available reports of the selected companies were able to provide amusing understanding and detailed knowledge about going green, practicing green business practices, and meeting ISO standards, thereby enabling the researcher to gather first-hand information to comprehend the singularities of Green IT practices.

Data Collection

Secondary data: Through Company reports and websites

Primary Data: Through Interviews and Questionnaires

The survey was conducted in two stages. First, the top management officials of IT companies were contacted and interviewed to understand the green IT practices being followed. The average duration of interviews was 20 minutes. Based on these interviews a survey questionnaire was prepared and circulated among the IT professionals and their responses were recorded.

Data collected through personal interviews and survey questionnaires was analyzed using discourse analysis methodology. The analysis was conducted to identify patterns. No new patterns emerged, so the researcher observed similarities between most and least used green IT practices.

Data Analysis and Interpretation

As mentioned above, the research question attempts to understand the extent to which the Indian IT industry has adapted green IT practices. The researcher tried to get it answered through the questionnaire.

The survey confirms the following things.

- The Indian IT industry has adapted green IT practices standardized by the International IT industry to a significant extent.
- Some are being followed cent percent while others by little less than 70%.
- The practices that are followed are Repurposing, Recycling, Green SCM, Health related, reducing carbon footprint, avoiding water wastage, Air, Water and Dust pollution, E waste management, going paperless, Using E vehicles, Solar lighting, and Conserving energy.

Fig 3 shows the graphical representation of green IT practices adopted by the Indian IT industry.

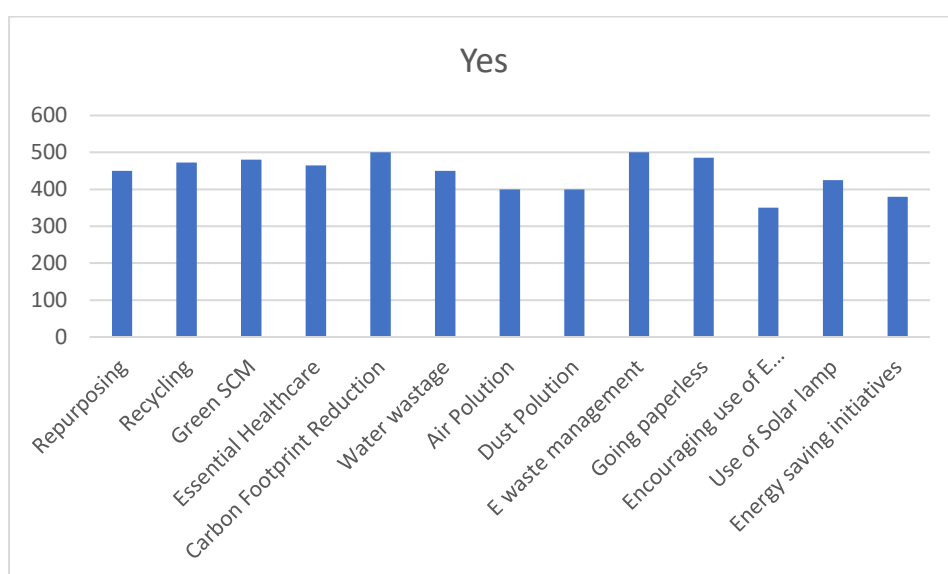


Fig. 3: IT industry and sustainability efforts

From the graph it is confirmed that the Indian IT Industry is conscious of sustainable development and taking efforts for offering healthy living to the co-residents of mother earth and their future generations.

From the graph it is also clear that Indian IT companies are following green IT practices like reducing Carbon Footprint and E waste management. But at the same time the Indian IT companies are not focusing enough on encouraging their employees to use Electric vehicles.

The interviews with the top management professional indicated that the IT industry of India understands the impact the going green initiative has on their business. They know that the customer is becoming aware of the environmental issues caused by the IT industry and is looking for green alternatives. Hence most of them are making going green their mission and are implementing strategies for its achievement.

Top management also understands that if they want to attract more foreign clients, it is mandatory to go green. If they do not adapt to those, it will have a direct impact on their trade profit.

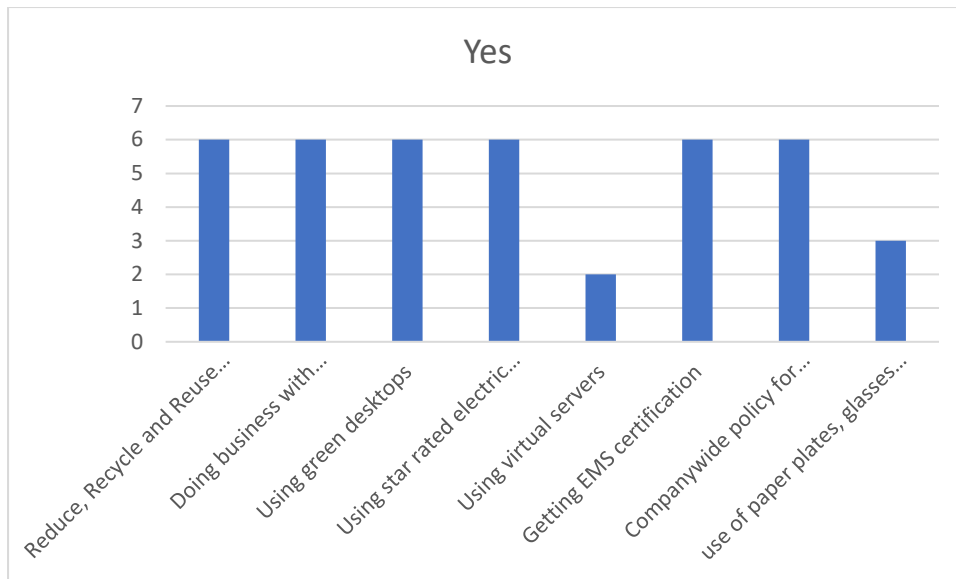


Fig 4: Top management responses

Figure 4 is the Graphical representation of responses recorded after interviewing the top management professionals of Indian IT companies.

From the graph it is clear that policies like reduce-recycle-reuse, buying from eco-friendly businesses, using green desktops, using star rated electric gadgets like a/ds, getting EMS certification and designing a company wide policy for electricity management are being incorporated in the long-term goals of all (100%) Indian IT companies. While 50% have banned use of paper products on campus, little more than 30% are using virtual servers.

Findings

- Sustainable development is the talk of the hour.
- Governments of all the countries agree that today's development shall not hamper the future of coming generations.
- Every developed and developing country has Environmental Legislation in place. Every business started in any corner of the world has to follow the green business practices.
- The Indian IT Industry is making conscious efforts to do business in an environmentally friendly way. It is reflected in their policies.
- The employees of the Indian IT Industry also affirm the efforts taken by them for sustainable development.
- The target of cent percent sustainable development is yet to be achieved.

Suggestions

The researcher suggests that the policymakers of the Indian IT industry must formulate policies that are comprehensive enough to carry businesses in greener ways. There should be a universal code of conduct designed for the entire IT industry over the world taking into consideration the fourth industrial revolution and the changes it is going to make to our day-to-day living.

The Limitations of the Study

The research had time and financial limitations. Collecting data (getting the questionnaires filled in by the IT professionals) was a tedious job as they had to be followed up repetitively. Also, it was difficult to get appointments from the top management officials due to their busy schedule.

Conclusion

Doing business without harming the environment is the new corporate social responsibility of every business and Indian IT industry is no exception to it. With the help of environmental legislation passed by the Indian Government, the IT industry is achieving its objective of sustainable development. The Indian IT industry understands that while exploring new horizons they must be ethically responsible. ISO certifications like 14001 are helping the Indian IT industry to maintain equivalence with international standards. Thence, adoption of Green Business Practices by the Indian IT industry will help them in getting more business from international customers and enhance reputation and goodwill.

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