



EXAMINATION OF GREEN IT STRATEGIES BY THE APPLICATION EXAMPLES

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Abstract

The main goal of this study is to examine the Green IT (Information Technology) application strategies through the world. The strategies will be explained by real life cases from several sectors. Nowadays, it is seen that the amount of carbon dioxide emission caused by information technologies worldwide is responsible for 2% of total carbon dioxide emissions. However, with the increasing and widespread use of information technologies, this figure is expected to increase in the coming years. If IT systems can be designed and used in accordance with the Green Information Technologies in the world, it will be possible to prevent the increase of the share of information technologies in CO₂ emissions. One of the first efficient results of green information technologies is the sleep mode that is activated when the user is not actively using the computer for a certain period. Turkey is advancing the use of information and communication services in parallel with the world. As the industry is developing, greenhouse gas emissions are low compared to developed countries, but the use of information technologies is becoming widespread. Therefore, it is possible to predict that this low rate will increase in the future. The purpose of this study is to benefit the literature about Green IT applications by the examples from the world.

Keywords: Green IT, Productivity, Environment, Recycling.

1. Introduction

In recent years, the Information Technology industry also defined as Green Information Technologies has identified IT as a way of addressing environmental problems and creating new market opportunities. Companies with a vision and technology to deliver services and products that address environmental problems can achieve a sustainable competitive advantage by reducing energy costs (Prybutok, 2008). In the Green Information Technologies movement, consumers' increasing awareness and responsibility towards the environment increased the pressure on the companies. Consumers' pressure on producers and the increase in the choice and use of environmentally sensitive products have led manufacturers to produce more sustainable and environmentally friendly products (Karaata, 2012).

The Green Information Technology concept emerged in 1992 when the US Environmental Protection Agency launched the 'Energy Star' environment application. With this application, the products used in information technologies are intended to be labeled according to their energy efficiency. Thus, the companies that will use these products can choose the most efficient products by means of these labels. Today, the concept of Green Information Technologies has a much broader meaning. Green Information Technology is defined as the use of information technologies in an environmentally sustainable manner (Gencer, 2016).

2. International Green Information Technology Policies and Programs

Information Technologies constitute an important part of the policies and programs determined in the context of the fight against environmental problems. Many OECD countries have prepared information technologies and environmental programs, but these programs and strategies differ from each other in view of the targeted objectives.

Different actors can be involved in the management of information technologies related policies. For example; In Denmark and Japan, government policies and programs on environment and informatics are managed centrally. In contrast, in England, green IT policies are managed centrally by local authorities and coordinated by national bodies. The work carried out by European Commission and Asian-Pacific Economic Cooperation is an example of green information policies and programs conducted by international organizations.

According to a study conducted by the OECD, the main topics of the 50 states examined in their policies and programs are as follows:

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- R & D and Innovation
 - R & D Programs
 - Green IT Supply
 - Innovation Support
 - Internationalization of R & D and Innovation
- Green Information Technology Propagation and Information Technology Applications
 - Green Information Technologies in Business
 - Standards and Labels
 - Public Institutions as Leading Users
 - Information Technology Applications for Individuals and Households
 - Institutional Change
- Environmental Information Technologies Skills and Awareness
 - Training of Consumers and Users
 - Energy Management Skills and Expertise

With the effective use of information equipment, it is possible to minimize the negative effects of the institutions and enterprises on the environment. Information technology applications such as remote work, tele-conference, e-commerce, e-government developed thanks to the technological developments are highly beneficial. In many countries such as Norway, Denmark and the United Kingdom, the development of these practices is supported and encouraged.

In the policies supporting Green Informatics, it is seen that some states directly support companies in order to increase innovation. An example of this is the Green Information Technologies Incentive Council in Japan. The Council works in cooperation with government, academics and sector representatives to produce innovative projects and promote innovation.

The orientation of enterprises to Green Informatics is included in many government plans, and these plans include practices that encourage enterprises to use Green IT. In this context, as an encouraging application, explanations are made on the energy consumption of green information equipment. One of the most important tools used to determine the environmental impact of products and services is called as the environmental label and the examples of most commonly used environmental labels are:

2.1. Energy Star:

In 1992, the US Environmental Protection Agency was created for computer equipment to support and encourage highly energy efficient products. Later, other technological devices such as heating and cooling systems, home electronics and office equipment were also included in this application. According to the statement made by the American Environmental Agency in 2007, Energy Star has prevented 40 million metric tons of greenhouse gas emissions in the US and saved about \$ 16 billion in bills. Thanks to the Energy Star versions developed over time, the field of application has been extended and much greater success has been achieved from the environmental protection and saving area. Energy Star is used not only in America, but also in Australia, Canada, New Zealand, Japan, China and the European Union.

2.2. European Union Environment Label:

Established in 1992 by the European Commission's Environmental Directorate in the context of sustainable production and consumption strategy. It is used in European Union countries, Norway and Iceland. In the eco-label scheme, products with the potential to reduce the environmental impact are encouraged. The product with this label is an environmentally friendly product ranging from raw material selection to its manufacture, distribution, consumption, use and subsequent recycling. The eco-label indicates the three most important features of the product in terms of its environmental impact (Erbiyik et al., 2012)

2.3. Blue Angel

Blue Angel is one of the oldest environmental labels. It was developed by the German Ministry of the Interior in 1978 and adopted by the German Ministry of the Environment. The label approved more than 3600 products from many different product groups. Energy consumption and recycling are among the most important criteria. It is used by more than 500 companies in more than twenty countries. People need a basic level of training in order to minimize the environmental impact of information technologies and to effectively use green information equipment. Therefore, programs and practices on informing the public



about green information technologies and raising awareness are of great importance. Electronic training options are generally preferred to create an understanding of environmental protection and awareness.

3. International Green IT Applications

In the context of green information technologies, policies and programs that encourage companies are implemented in many countries. The two most important countries that can be mentioned are England and Japan. British Telecom, the UK's established operator, is working on new technologies to reduce energy consumption and strives to reduce carbon emissions. The communication sector is one of the most important tools for providing global support as well as meeting social needs (Gencer, 2019).

In this field, British Telecom aims to minimize the carbon dioxide emission of the products and services it develops and helps its subscribers. In addition to these, British Telecom supports the green cognition with its policies within its own company and broadens the scope of education by raising awareness of its employees. British Telecom encourages its employees to consume less energy and implements some campaigns. They implement the five-item savings plan, shown below, to ensure energy savings within the company:

1. Switching off electrical devices
2. Use of stairs instead of elevator
3. Keeping the windows closed, ensuring the efficient operation of the heating and cooling systems of the building
4. Considering energy efficiency during the purchase of a new device or the use of devices
5. Less use of printers

British Telecom continuously monitors and analyzes internal energy use. By eliminating unused servers in data centers, rectifying heating cooling systems, installing energy efficient lighting system, closing down unused equipment, energy consumption has been reduced by 53 GWh per year and 20.000 tons of CO2 emissions have been prevented.

In addition, British Telecom continues to work in many different areas to reduce carbon footprint and encourage green information technologies.

On the other hand, Japan is one of the first countries to notice the negative effects of the use of ever-increasing information technologies. In 2007, the Green Information Technologies Initiative was initiated by the Ministry of Economy, Trade and Industry. The initiative focused on energy-saving products and the use of energy-saving systems was encouraged. In 2008, "Green Informatics Incentive Council was established. This council is working on international cooperation studies to determine international standards for technologies that will increase energy efficiency and reduce energy consumption and to share sample practices.

Large companies in Japan support green cognition and produce innovative projects in this context. Some innovative green technologies run by IT companies are shown below:

3.1. Hitachi:

In 2008, it established a unit called Environmental Strategy Office to be responsible for the company's environmental strategies. The main tasks of this office include environmental business management and the determination of policies in this area, networking in the fight against global environmental problems, and determination of strategies in the field of technology and business development.

3.2. NEC:

In November 2007, NEC launched the EC Real IT Cool Kasım project. With this project, NEC plans to reduce energy consumption through energy saving platform and energy saving control software.

3.3. Fujitsu:

In late 2007, it launched an application called "Green Innovative Policy •. The aim of this application is to achieve a reduction in carbon dioxide emissions. In addition, Fujitsu has achieved great success in promoting and delivering low-energy products.

4. Smart 2020 Program

While there have been many studies on minimizing the environmental impacts of information technologies and ensuring sustainability, the most important of these studies was Smart 2020. In the introduction of the Smart 2020 program, a special section is devoted to the IT sector and the importance of this sector and its contribution to the world economy are emphasized by the following two items:



1. Information technologies have become one of the sectors that contributed the most to the economy in recent years. Between 2002 and 2007, 16% of the GDP growth was in the ICT sector and the share of the sector in GDP increased from 5.3% to 7.3%. Furthermore, the ICT sector is expected to constitute 8.7% of GDP by 2020.

2. In addition, the use of information technologies contributes to the development of other areas of the economy. According to a study by the OECD, one-third of the economic development between 1970 and 1990 is claimed to be due to fixed-line telecommunications networks, which reduce operator costs and allow operators to enter new markets.

On the other hand, the use of information technologies leads to an increase in negative environmental impacts due to electricity usage. The connection between the increase in the use of the IT sector and the economic development needs to be maintained and at the same time the balance between the environmental impacts related to information technologies and climate change should be ensured.

According to the Smart 2020 report, the use of information solutions in buildings, transportation, power supplies and manufacturing industry suggests that as of 2020, greenhouse gas emissions can be reduced by up to 7.8 Giga-ton CO₂. On the other hand, it is estimated that the greenhouse gas emissions caused by the IT sector in the same period will be 1.4 Giga-ton CO₂. The Smart 2020 report proposes five different views to reduce environmental impact:

- Standardize: Standard forms of energy use in different sectors can be provided.
- Monitoring: Monitoring of energy consumption and provision of information can be provided.
- Calculate: Improve energy accountability through software tools and platforms.
- Rethinking: Innovative suggestions can be offered when designing buildings, roads and infrastructures.
- Transform: Develop energy management systems and processes with intelligent and integrated approaches.

5. Green IT Policies and Programs in Turkey

5.1. Climate Change Analysis

Science of climate change issues in Turkey are assessed under the general 'Green' topic. Thus, the studies on climate change in Turkey are carried out by the Ministry of Environment and Forests (Gencer, 2018). The Climate Change Environment Convention and the Kyoto Protocol (KP), which are the focus of international studies on this subject, are international agreements with a wide participation. On the one hand, while introducing legal regulations on limiting and reducing human-source greenhouse gas emissions, the convention and the protocol address the strategic issues about international emission trade, technology and capital movements.

In this context, in 2001 the Climate Change Coordination Committee (CBCC) was founded and was restructured in 2004 with the participation of different institutions in Turkey. The purpose of establishment of this committee was for ensuring;

- the prevention of the harmful effects of climate change,
- that the works to be carried out in this area are more efficient,
- the distribution of duties of public and private sector organizations and the emergence of appropriate domestic and foreign policies in this regard.

Eight different working groups have been established:

- Research on the Effects of Climate Change
- Greenhouse Gases Emission Inventory
- Greenhouse Gas Reduction in Industrial, Residential, Waste Management and Service Sectors
- Greenhouse Gas Reduction in Energy Sector
- Greenhouse Gas Reduction in Transportation Sector
- Land Use, Land Use Change and Forestry
- Policy and Strategy Development
- Education and public awareness

Also, a web site about Climate Change was established to inform about climate change, collect resources and announce the works carried out.



The most important development on climate change in Turkey is signing the Kyoto Protocol. The Kyoto Protocol covers more than 55% of 160 countries and greenhouse gas emissions. The aim of the protocol is to minimize the environmental impact with the measures to be taken. The most important articles of this Convention are as follows:

- The amount of greenhouse gas released into the atmosphere will be reduced by at least 5%,
- Legislation to reduce the amount of greenhouse gases from industry, motor vehicles, heating,
- Warming up with less energy, taking long journeys with less energy consuming technologies, less energy consuming technology systems will be provided to the industry, environmentalism will be the basic principle in transportation, waste storage,
 - Reduce the amount of methane and carbon dioxide released into the atmosphere and turn to alternative energy sources,
 - Fossil fuels will be used instead of bio-diesel fuel
 - Waste operations will be reorganized in high energy consuming enterprises such as cement, iron-steel and lime plants,
 - Less carbon extraction systems, technologies will be introduced in thermal power plants,
 - Solar energy will be opened, because this energy will be highlighted in the world because carbon is zero in nuclear energy,
 - More taxes will be charged than consuming excess fuel and generating excess carbon.

5.2. Green IT activities in Turkey

The authorities in Turkey are also trying to demonstrate the contribution of greenhouse gas emissions to information and communication technologies, but there are no clear figures yet (Akkucuk et al., 2016). In fact, the proportion of ICT-induced emissions in the world does not exceed 2.5%. Turkey is advancing the use of information and communication services in parallel with the world. As the industry is developing, greenhouse gas emissions are still very low when compared to developed countries, but the use of information technologies is becoming widespread. Therefore, it is possible to predict that this low rate will increase in the future.

On the other hand, to increase the awareness of green IT in Turkey, the studies on this subject have increased by the number of institutions and organizations engaged. For example; Among the studies carried out by the Ministry of Industry and Trade, attention is given to activities aimed at informing consumers about fuel consumption and emissions. As the ministry is the prior responsible for the transport sector, the Ministry of Transport also has studies on the subject. The Ministry of Transport has an important role in the production of biofuels and the production and use of vehicles using these fuels. It is seen that the device manufacturers working in the information technologies and communication sector also have done many studies to support green informatics. Producers focus on lower energy-powered devices, while at the same time reducing the use of toxic substances, and increasing the use of recyclable materials, using less paper and developing products that are compatible with renewable energy sources.

6. Conclusion

It is observed that the enterprises in the IT sector are also oriented towards green information technologies and they are working on this subject. Projects such as remotely working services, encouraging the use of alternative energy sources, establishing environmentalist base stations, increasing the efficiency of infrastructure devices, and increasing the use of applications such as e-invoices and e-signatures are carried out by the enterprises in which they are responsible. Another issue that the information technologies and communication sector should address in the field of green informatics is the evaluation of plastic and toxic wastes. It is observed that the public awareness of this issue increases throughout the world (Akkucuk, 2016). It is also seen that the producers have started to work on collecting old phones and batteries and bringing them back to production (Gencer, 2017). This situation is of great importance in terms of saving and re-evaluating to the economy as well as preventing the wastes from being harmful to the environment and preventing the existence of long-term existence.

Many non-governmental organizations working in the field of green IT have become operational. This is a very important development. Increasing awareness among consumers and voluntary activities will contribute to the improvement of green IT sensitivity in Turkey. However, to ensure more and faster results, studies in this area should be considered as a country policy, policies to be followed in the long term and the activities and those responsible should be identified.



In summary; Turkey is seen that the green IT to target by device manufacturers and electronic communications operators, thus there are many studies and campaigns have been launched and public awareness by NGOs and execution of certain efforts to reduce climate change. In addition, short and long-term strategies will be identified and action plans to support green informatics will be created and moves to be taken by the whole community will be useful.

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